United States Department of Agriculture

Hicks-Pikes Peak Allotment Grazing Authorization

Preliminary Environmental Assessment

Forest Service Tonto National Forest, Globe Ranger District September 2017

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Allotment Description and Location

Hicks-Pikes Peak allotment is located on Globe Ranger District, eight miles north and northwest of Globe, Arizona in Gila County (Figure 1). It encompasses a total area of 66,838 acres spread out over 18 pastures. Pastures range from over 10,000 acres to less than 500 acres. Salt River forms part of the allotment's northern boundary, and Pinal Creek flows through allotment from south to north. In total, there are 56 miles of creeks and washes flowing through Hicks-Pikes Peak. Topographical features range from nearly level valley and elevated plains to very steep mountains and escarpments. About 70% of the allotment is composed of nearly level to moderately steep slopes ranging from 0 to 40 percent. Elevations range from about 2,200 to 6,600 feet. The mean annual precipitation at the nearby town of Globe is about 16 inches (elevation 3550 feet). The precipitation on the allotment, based on Terrestrial Ecosystems gradient analysis, ranges from approximately 13 inches at the lower elevations to 22 inches at the higher elevations.

A large part of this range is composed of decomposed granite soil, which is extremely susceptible to erosion. The vegetation communities in the allotment are primarily Sonoran desert scrub in lower elevations (as low as 2,200 feet), semi-desert grasslands and chaparral in middle elevations, and pinyon-juniper-oak woodlands in high elevations (as high as 5,385 feet).

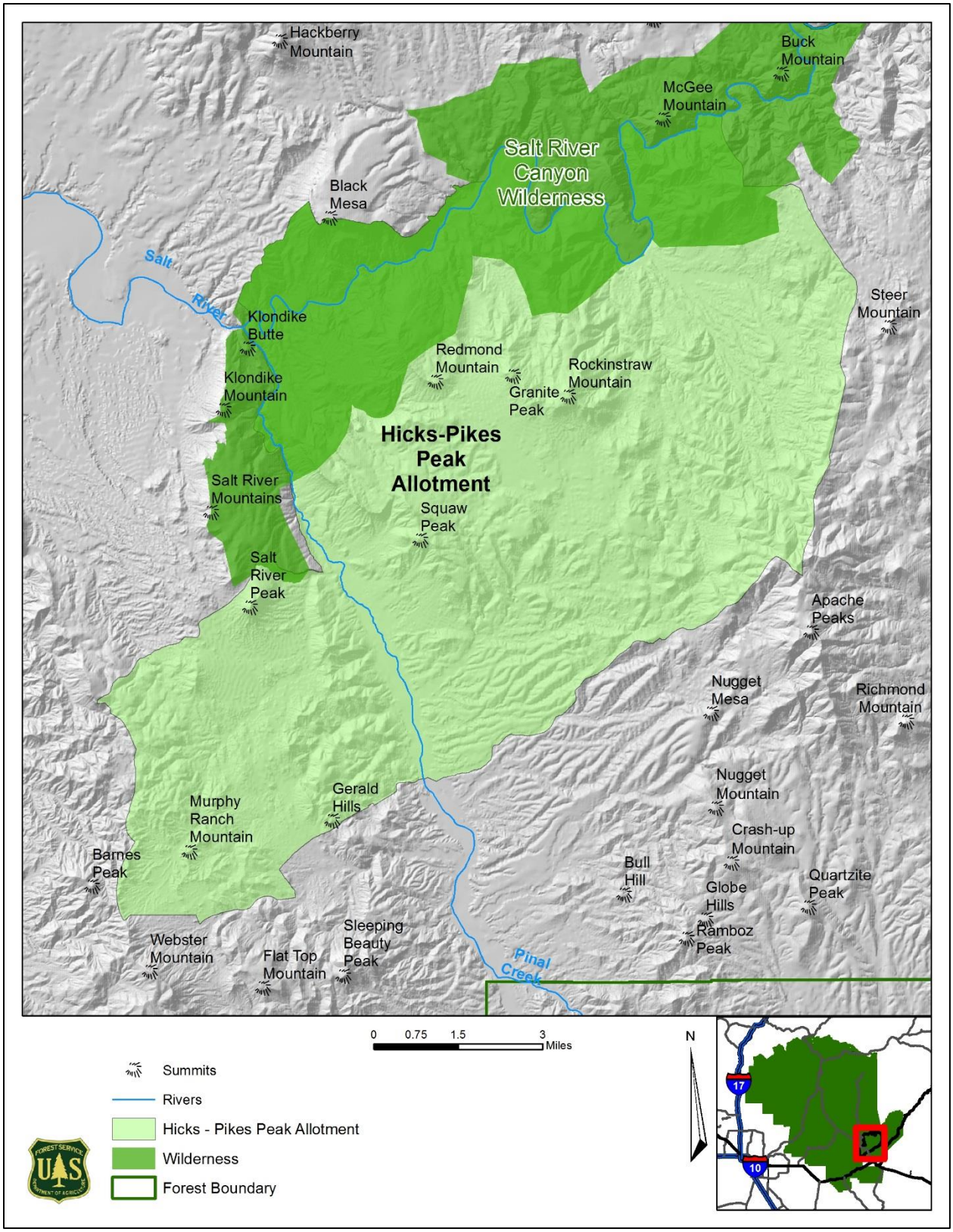

Figure 1: Map of Hicks-Pikes Peak Allotment Location

Allotment Management History

Livestock grazing, under various permittees, has occurred over the last hundred years on Hicks-Pikes Peak allotment. More recently, H&E Ranch, Inc. was the range permittee from 1982 until 2006. H & E Ranch, Inc. split livestock into three groups which were rotated between a set of pastures, spending approximately one to three months in each pasture. In 2002, an extreme drought necessitated livestock removal across the Tonto National Forest. This culminated in full removal of livestock from the Hicks-Pikes Peak Allotment by 2003 until 2004.

Rockin Four Ranch LLC bought the base property for the allotment in 2006, and was issued a permit to graze the same year.

Current Grazing Management

Rockin Four Ranch LLC currently incorporates a rotational grazing strategy to allow rest on grazed plants. Monitoring during the grazing year focuses on grazing utilization and intensity, which is evaluated by estimating amount of a grazed plant left and vigor of plants, precipitation, and growth stage of key species. There is a utilization limit, which was scientifically derived and concurred on in consultation with United States Fish and Wildlife Service, of 30 to 40 percent for upland grasses, 50 percent for desirable browse species, 50 percent for woody riparian species, and 30 percent for herbaceous riparian species.

Consultation with United States Fish and Wildlife Service, regarding fish in Salt River, concluded in compliance from an August 2005 letter. Livestock will not enter Ortega or Lower Shute Springs pasture to allow for improvement of riparian habitat along the Salt River.

Livestock numbers have slowly increased since 2006, but average between 290 to 670.

Existing Range Improvements

Range improvements on the allotment have been added over time. As improvements were needed, maintenance responsibility was then added to term grazing permit.

The current status of improvements vary and are evaluated depending on various factors: accessibility, water production, and changed management strategies. Several improvements currently included in the permit are no longer maintained often due to changes in management strategies. All existing improvements are located in Appendix D.

The Forest Service requires all improvements listed in the Term Grazing Permit to be maintained to standards agreed upon by the permittee and the Forest Service through a permit modification or Annual Operating Instructions. Improvements on Forest Service lands are property of United States Government, unless through a cooperative agreement. The Hicks-Pikes Peak permittee does not hold any of these cooperative agreements.

Existing and Desired Conditions

Existing conditions describe the current management situation and environmental conditions within the project area. Desired conditions describe how the resource should function after the project is implemented and are defined by Forest Plan guidance and the best available scientific information.

The Forest Plan identifies management prescriptions and management emphasis for particular management areas across the Tonto National Forest. The Hicks-Pikes Peak Allotment is entirely within Management Areas 2F and 2B (Forest Service 1985). Management emphasis for area 2F, the Globe Ranger District, is to "manage for a variety of renewable natural resources with primary emphasis on wildlife habitat improvement, water quality maintenance, livestock forage production, and dispersed recreation. Watersheds will be managed so as to improve them to a satisfactory or better condition. Improve and manage the included riparian areas (as defined by FSM 2526) to benefit riparian dependent resources" (Forest Plan, page 85).

Management Area 2B encompasses the Salt River Canyon Wilderness. "The primary emphasis for this area is the preservation of naturally occurring flora, fauna, aesthetics and ecological processes while providing a very high quality white water river running experience. Special consideration will be given to nesting bald eagle home range requirements. Watershed protection is also an important emphasis, and the stream shall be maintained in a free flowing condition with water quality maintained or improved. Other activities that are authorized by the Wilderness Act will be conducted so as to minimize their impact on wilderness character. The portion of this management area from near the Highway 288 bridge upstream to the Fort Apache Reservation boundary was studied by the Forest Service for inclusion in the National Wild and Scenic Rivers System at the direction of the U.S. Congress. Present management emphasis will not preclude future Congressional designation of this river." (Forest Plan, page 76)

Resources chosen to illustrate the existing and desired condition for this project are indicators of range management: vegetation, soils, riparian, water quality, and watershed conditions. For resource managers to determine if a project is moving toward its desired condition, the resource's condition must be measurable over time.

Vegetation

Existing Conditions

The vegetation communities in the allotment are primarily Sonoran desert scrub in lower elevations (as low as 2,200 feet), semi-desert grasslands and chaparral in middle elevations, and pinyon-juniper-oak woodlands in high elevations (as high as 5,385 feet) (Figure 2).

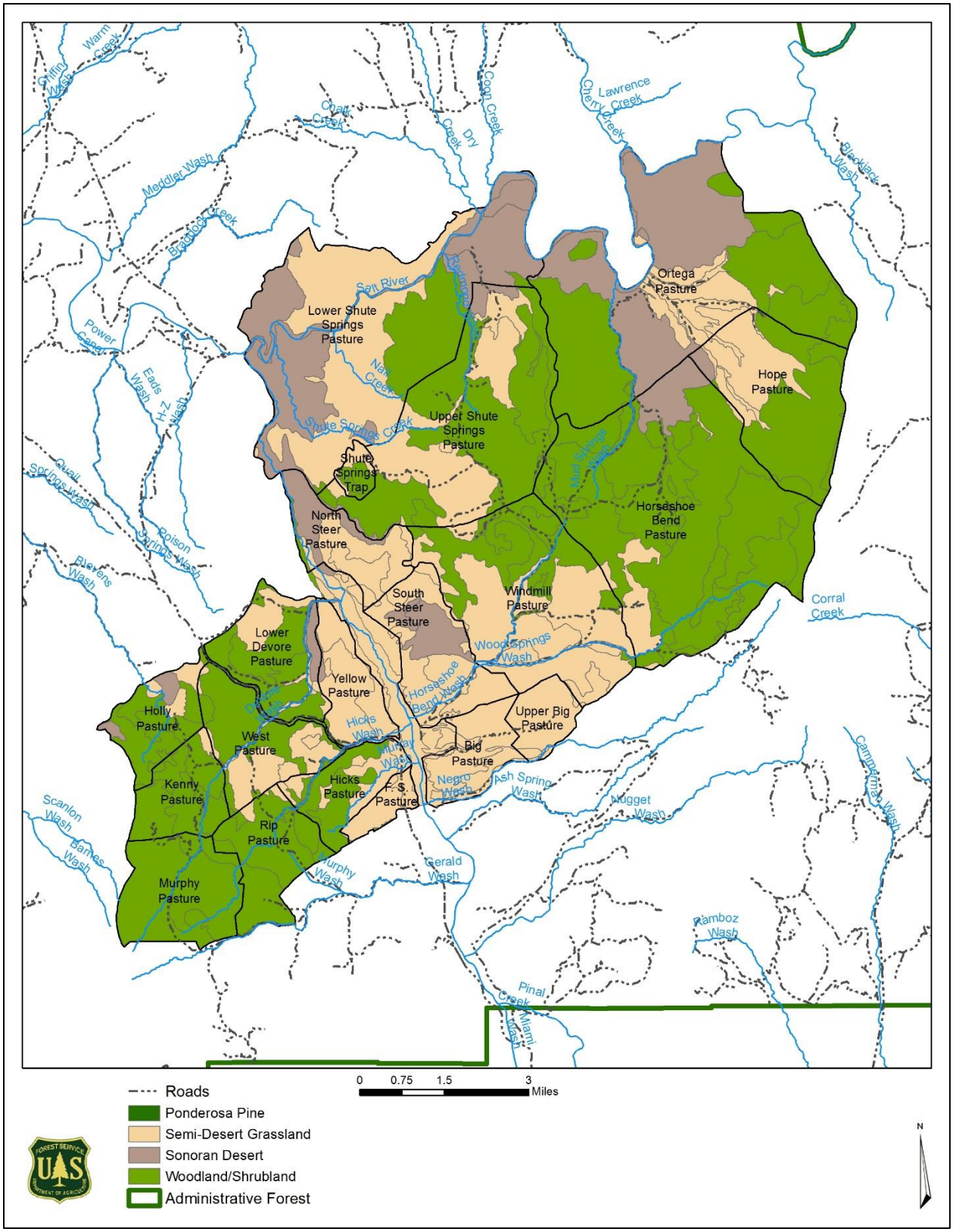

Figure 2: Broad Vegetation Communities on the Hicks-Pikes Peak Allotment

In Table 1 vegetation types have been grouped by pasture. Broad vegetation groups are groupings of climax plant communities named for characteristic and diagnostic plants that distinguish one plant community from another (USDA, Terrestrial Ecosystem Survey Handbook, 1985. pp. 4-25 to 4-27). There may be a large degree of variability within the broad vegetation groups. The vegetative types were developed from Terrestrial Ecosystem Survey Terrestrial Ecosystem Unit Inventory (TES/TEUI) surveys, aerial photo interpretation, satellite imagery, and on-the-ground observations. Not all types and delineations were field validated. In some cases, the vegetation was mapped as an association of two vegetation types. Where two vegetation types occur together in one map unit, the drier vegetation component normally occurs on southern aspects while the wetter component occurs on northern aspects. The vegetation map and Table 1 serve as a basis for identification of coarse-filter vegetation types.

Table 1: Broad Vegetation Groups by Pasture

Pasture Name	Broad Vegetation Groups	Acres
Big Pasture		
	Riparian Vegetation	171
	Semi-Desert Grasslands	1,090
F. S. Pasture		
	Sonoran Desert Scrub	449
	Turbinella Oak Chaparral	22
Hicks Pasture		
	Juniper Savannas	294
	Riparian Vegetation	30
	Sonoran Desert Scrub	932
	Turbinella Oak Chaparral	105
Holly Pasture		
	Juniper Savannas	467
	Semi-Desert Grasslands	661
	Sonoran Desert Scrub	55
	Turbinella Oak Chaparral	119
	Woodlands (Juniper and Pinyon/Juniper)	112
Hope Pasture		
	Juniper Savannas	158
	Riparian Vegetation	144
	Semi-Desert Grasslands	503
	Sonoran Desert Scrub	623
	Turbinella Oak Chaparral	2,181
	Woodlands (Juniper and Pinyon/Juniper)	35
Horseshoe Bend Pasture		
	Juniper Savannas	1,585
	Riparian Vegetation	92
	Semi-Desert Grasslands	322
	Sonoran Desert Scrub	391
	Turbinella Oak Chaparral	5,536
	Woodlands (Juniper and Pinyon/Juniper)	2,210
Kenny Pasture		
	Juniper Savannas	121
	Riparian Vegetation	11
	Semi-Desert Grasslands	488
	Turbinella Oak Chaparral	774
	Woodlands (Juniper and Pinyon/Juniper)	74
Lower Devore Pasture		
	Juniper Savannas	0
	Riparian Vegetation	116
	Semi-Desert Grasslands	303
	Sonoran Desert Scrub	958
	Turbinella Oak Chaparral	694

Pasture Name	Broad Vegetation Groups	Acres
	Woodlands (Juniper and Pinyon/Juniper)	26
Murphy Pasture		
	Juniper Savannas	106
	Riparian Vegetation	2
	Turbinella Oak Chaparral	1,391
	Woodlands (Juniper and Pinyon/Juniper)	876
North Steer Pasture		
	Juniper Savannas	0
	Riparian Vegetation	52
	Semi-Desert Grasslands	378
	Sonoran Desert Scrub	1,151
	Turbinella Oak Chaparral	1
	Woodlands (Juniper and Pinyon/Juniper)	5
Ortega Pasture		
	Juniper Savannas	1,688
	Riparian Vegetation	669
	Semi-Desert Grasslands	787
	Sonoran Desert Scrub	4,972
	Turbinella Oak Chaparral	1,128
	Woodlands (Juniper and Pinyon/Juniper)	77
Pvt/No Grazing		
	Juniper Savannas	63
	Riparian Vegetation	829
	Semi-Desert Grasslands	390
	Sonoran Desert Scrub	325
	Turbinella Oak Chaparral	33
Rip Pasture		
	Juniper Savannas	97
	Riparian Vegetation	51
	Sonoran Desert Scrub	162
	Turbinella Oak Chaparral	1,050
	Woodlands (Juniper and Pinyon/Juniper)	496
Shute Springs Pasture		
	Juniper Savannas	1,770
	Riparian Vegetation	673
	Semi-Desert Grasslands	2,340
	Sonoran Desert Scrub	6,996
	Turbinella Oak Chaparral	2,906
	Woodlands (Juniper and Pinyon/Juniper)	1,031
Shute Springs Trap		
	Juniper Savannas	113
	Semi-Desert Grasslands	11
	Turbinella Oak Chaparral	154
	Woodlands (Juniper and Pinyon/Juniper)	36
South Steer Pasture		
	Juniper Savannas	15
	Riparian Vegetation	192
	Semi-Desert Grasslands	1,386
	Sonoran Desert Scrub	685
	Turbinella Oak Chaparral	13
Upper Big Pasture		
	Riparian Vegetation	32
	Semi-Desert Grasslands	800
West Pasture		
	Juniper Savannas	35
	Riparian Vegetation	70
	Semi-Desert Grasslands	39
	Sonoran Desert Scrub	395

Pasture Name	Broad Vegetation Groups	Acres
	Turbinella Oak Chaparral	1,463
	Woodlands (Juniper and Pinyon/Juniper)	79
Windmill Pasture		
	Juniper Savannas	1,457
	Riparian Vegetation	167
	Semi-Desert Grasslands	2,483
	Sonoran Desert Scrub	149
	Turbinella Oak Chaparral	965
	Woodlands (Juniper and Pinyon/Juniper)	428
Yellow Pasture		
	Riparian Vegetation	28
	Sonoran Desert Scrub	1,300
	Turbinella Oak Chaparral	0
Total		66,838

Production Utilization Studies

Production utilization studies are conducted as a snap shot in time of the area's carrying capacity. These utilization studies map patterns and patches of livestock grazing, radiating from available water sources. According to Forest Service (Production Utilization Surveys, 1988), "diversity of available forage, species preferences, and livestock behavior create disparities between areas of production and areas of utilization", which are identified through these maps. Analyses of carrying capacity made during these studies are calculated with allowable use standards, but are used best for planning and administration, not for a final determination of estimated grazing capacity. The outcome is shown as animal unit months (AUMs) by pasture, based on current conditions.

In 1985, a production utilization study was conducted throughout the entire allotment. At that time, the allotment was under continuous yearlong grazing with low forage cover and decreased soil stability, based on long term monitoring data. These conditions, when reviewed by Forest Service personnel, recommended allowable livestock grazing use to be set at 20 percent key perennial grasses and 30 percent key browse. These recommendations were made, but never implemented, on the allotment. Allowable use was measured in areas where livestock had access and was not measured on highly erodible soils or areas with no palatable perennial forage.

This 1985 study determined that the majority of the allotment was stocked at higher levels than what is sustainable for forage plants. At that time, utilization on key species was found to be between 60 and 80 percent. Livestock were not moved to areas of lower utilization and instead congregated in easily accessible areas before moving to others. This lack of livestock distribution was noted by the difference in vegetation between easily and tougher areas to access, due largely to excessive stocking and continuous yearlong grazing. Pasture structure did not allow for reasonable livestock rotations and new fences were recommended to offset these results. Lower Shute pasture had a distribution problem due to the available water sources in the canyon bottoms of Shute canyon and the Salt River. The conclusion and recommendation of that study determined that for an allotment under a rotational management strategy with two out of three years rest, back to back, capacity could be 629 head of cattle with 522 head natural increase.

Parker Three-Step Monitoring Sites

Parker Three-Step permanent monitoring sites (Clusters) and pace transects were established on the allotment in the late 1950s. This monitoring method is designed to measure long term vegetation condition, vegetation trend and cover, plant relative abundance and composition, soil stability, and soil trend. Vegetation trend refers to vegetative conditions based on available forage for livestock. Relative species abundance refers to how common or rare a species is relative to other species in a given location or community. This is calculated by weighted percentage of species hits and nearest plant frequency. Clusters provide useful data analysis of species relative composition (Ruyle & Dyess, 2010) and clearly shows a significant change in vegetative composition through time. This is generally consistent with a regional shift in vegetation composition (Grover & Musick, 1990). This regional shift has been thought to be a function of domestic grazing, fire suppression, and climate change.

Overall, Cluster monitoring has shown the allotment has exhibited a loss of forage cover and reduction in soil stability, while species richness has slowly increased. Curly mesquite is a short sod forming grass that is able to quickly respond to rain events, greening up faster than other perennial species. Curly mesquite has a high grazing tolerance providing important livestock forage and with proper rest it will allow for maximum production. Due to its quick response to rain events, it does not do well in drought conditions. Roots of curly mesquite are shallower than bunchgrasses, which can reach deeper into the soil in search of water. In the past, curly mesquite dominated the landscape but has markedly declined since.

In 1984, much of the allotment had lost curly mesquite cover and a slight increase of woody plant recruitment such as false mesquite, wrights buckwheat, and snakeweed. Snakeweed tends to fluctuate throughout years and isn't necessarily tied to plant diversity.

The last Cluster reading, in 2009, indicated diversity is slowly increasing with bunchgrasses and woody plants. Although diversity is increasing, cover remains lacking for soil protection. Grasses remain present at the site, but utilization appears to have shifted from grasses to a mixture of grasses and woody plants.

Reading the Range Monitoring Sites

In 2007, six key areas were established across the allotment as Reading the Range monitoring sites (Figure 3). Reading the Range monitoring involves gathering data on herbaceous and half shrub vegetative cover, utilization monitoring, forage production, frequency, browse monitoring, onsite precipitation data, and characterization of soils. The intent of this data collection is to assist rangeland managers in making timely decisions relative to livestock management. Long term vegetative trend can be extrapolated from these data into the future. Protocols for Reading the Range were established collaboratively between the United States Department of Agriculture-Forest Service and Natural Resource Conservation Service, University of Arizona, University of Arizona's Gila County Cooperative Extension, and local livestock ranchers.

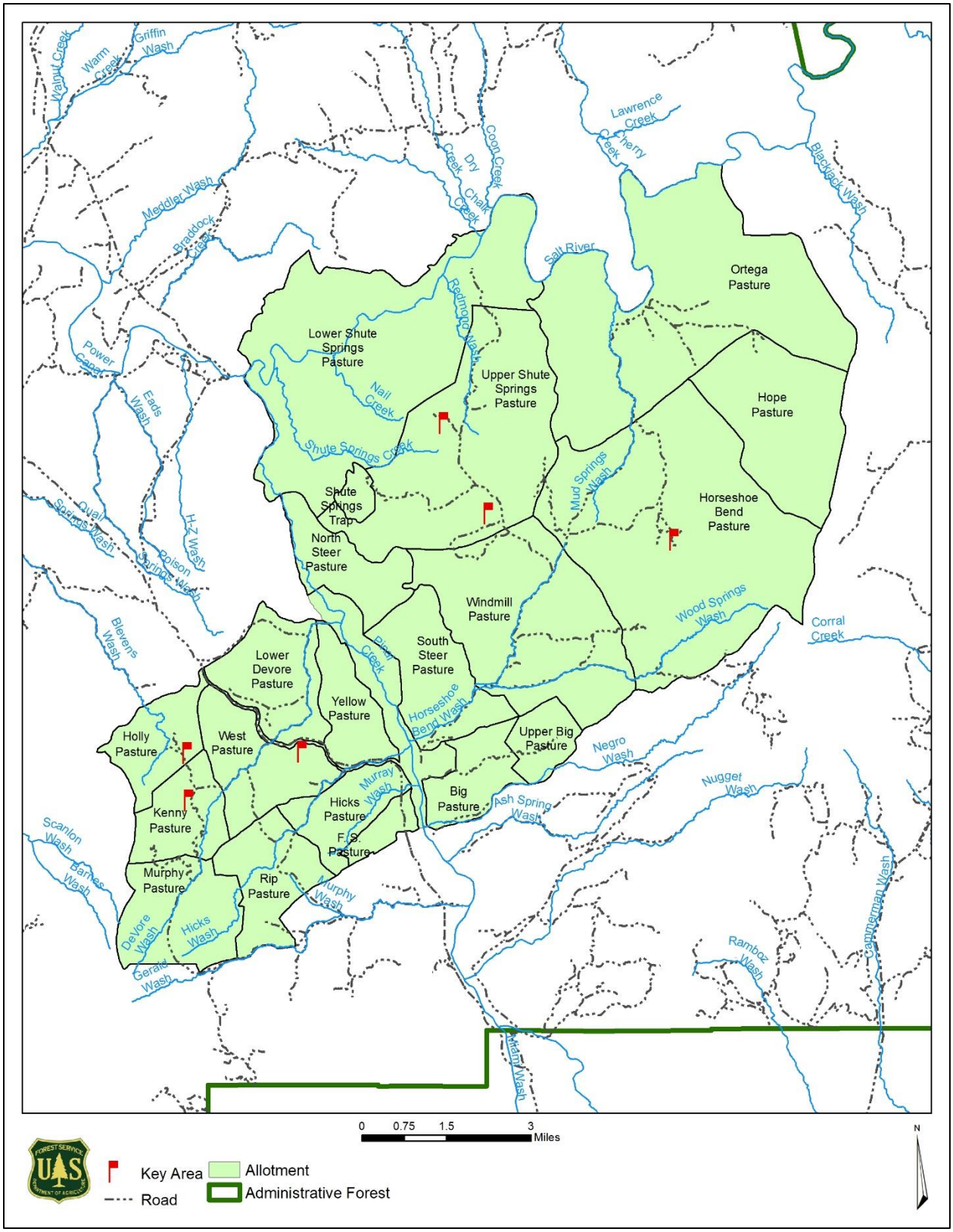

Figure 3: Map Showing Key Areas Established on the Hicks-Pikes Peak Allotment

Overall, enough data has been collected to establish a plant trend. Perennial grasses have begun to establish, but it is too soon to see an upward or positive trend. Curly mesquite remains the dominate species. Increases in palatable woody shrubs such as false mesquite and shrubby buckwheat are occurring, but not enough to dominate the site. In areas dominated by brush and woody plants, little change is predicted over time, and is expected to stay this way until a major influence such as fire occurs on the landscape. Forage production highlights an uneven establishment of plants, as seen in monitoring data. The highest forage production, adjusted for livestock use, was seen in Windmill pasture at just under 250 pounds per acre.

Rangeland Health Evaluations

In 2008, Natural Resource Conservation Service (NRCS) worked with the Forest Service and permittee to establish a quantitative assessment of rangeland health on Hicks Pikes Peak Allotment to assist in awarding an environmental quality improvement contract for assistance in rangeland projects to further improve soil and site stability, hydrologic function, and biotic integrity categories throughout the allotment. This assessment rates seventeen indicators, each with a corresponding departure from expected rating. For this process, NRCS identified an ecological site, closely related to each location that an evaluation was completed. This ecological site offered an approximate baseline in which to establish a departure from expected rating.

Three sites were observed, and it was determined all lacked bunchgrasses that typically grow in the spring and summer months, which would typically be expected on this allotment. It was noted, these plants were seen during the surveys, but in low amounts. Root exposure due to erosion of soil from the surface, causing a pedestalling of the roots was evident but not extensive. Often this is due to a change in vegetation type. Heavy historic livestock grazing was identified as a potential cause for the change in vegetation.

Inspections

Inspections on Hicks Pike's Peak range from improvement inspections, mid-season utilization, and physical observations or ocular descriptions to livestock brand identification. Most relevant to this analysis is mid-season utilization and ocular descriptions. Mid-season utilization requires measurements of grasses (i.e. sideoats grama) or brush plants (i.e. jojoba). Data is gathered at selected areas throughout a pasture in which livestock are or have currently been grazing. Locations must be in places where livestock use and at least half a mile from water, congregated areas, and salts. Locations vary yearly depending on water availability, livestock distribution, and other factors. Depending on pasture forage, data on grasses or brush plants or both will be gathered. Grass measurements rely on heights of un-grazed and grazed key species, or species grazed by livestock, as outlined in "Utilization Studies and Residual Measurements" (Management, 1999). These measurements are independent of the pastures annual production. Measurements determine average plant utilization for a pasture, during mid-season grazing. Most sites on the Hicks Pike's Peak Allotment measure curly mesquite, a short sod forming grass. Other key species are bunch grasses, such as sideoats grama, creating a bunch formation on soil surface. These data ensure utilization levels, identified in the Term Grazing Permit, are being met.

Concerns expressed in 2012 and 2013 inspections in Hicks pasture indicated high levels of utilization, especially on an old reclaimed roadbed and distance to water. The roadbed does not reflect vegetation in the pasture, but is an area to watch to ensure proper reclamation. An inspection in 2013 on Holly pasture

outlined a difference between a ten year rested pasture and a grazed pasture. The rested pasture exhibited several different types of perennial bunchgrasses with more vigor than species seen on grazed pastures. A riparian area is split by a fence line, falling between the rested and grazed pasture. This riparian area contained more water dependent herbaceous plants and palatable woody riparian species on the rested side. Holly pasture, on the grazed side, had more woody species, annual grasses and forbs.

In 2014 and 2015, rangeland mid-season inspections were completed and the apparent trend did not identify any areas of concern. All midseason utilization data was within grazing standards. It was noted that soil and vegetation point in time trend was stable, but lack of perennial grasses and past hedging on woody species was visible. A majority of existing improvements visited during inspections were full of water and supporting livestock.

Overall since 2010, patterns of grazing utilization have been manageable and within set use standards. Vegetation observed appears to agree with Reading the Range, Parker 3-Step Cluster and rangeland health evaluation data.

Desired Conditions

According to the Forest Plan, the Tonto National Forest should manage vegetation types such as: chaparral, semi-desert grasslands, and desert scrub to meet the needs of both livestock and wildlife (pp. 66-68). The overall goal of vegetation management in relation to rangeland management is to maintain 30 percent ground cover where the current level of development allows and where opportunities exist while providing for multiple use of the range for domestic livestock grazing (Forest Plan p. 68-1). Table 2shows the specific desired conditions for the Hicks-Pikes Peak Allotment.

In order to optimize production and utilization of forage allocated for livestock, as well as reach the management goal of 30 percent ground cover, it is our objective to balance permitted grazing use with available forage allocated for use by domestic livestock. To determine if and where management goals are being reached, evaluations are made on the ground. This is done by identifying key forage monitoring areas. The desired condition for these key species would be for maintenance of satisfactory conditions and improvement of less than satisfactory conditions of preferred herbaceous and browse species for cattle and native ungulates, as well as maintenance or improvement in canopy and basal cover for soil protection.

Table 2: Specific Desired Conditions for the Allotment

Forest Direction	Specific Desired Condition	How to measure Desired Condition
Maintain or obtain a minimum of 30 percent effective ground cover for watershed protection and forage production, especially in primary wildlife forage producing areas.	Maintain or improve, as compared to local TEUI native species cover, litter and vigor through both short term and long term monitoring in key areas. Grazing will be managed so allowable use thresholds are not exceeded, at minimum, during a pasture's grazing period.	Utilize short and long term monitoring protocol to capture ground cover, plant vigor, litter, and herbaceous perennial grass utilization.
Coordinate with range to achieve utilization in riparian areas that will not exceed 20 percent current annual growth by volume of woody species.	Utilization in riparian areas will not exceed 50% of terminal leaders of trees and shrubs under 6 feet tall.	Riparian utilization will be measured, at minimum, while livestock are in pasture.
Livestock are authorized only on areas specified in term grazing permit.	Manage livestock grazing on appropriate pastures through managed grazing methods.	Livestock will be kept on the allotment.

Soils

Existing Conditions

The Hicks-Pikes Peak Allotment contains variable soil types due to the type of parent material, landforms, and natural processes which form them. The allotment is underlain by a wide variety of geologic types. Granite dominates covering about 42% of the allotment. Volcanic formations mostly rhyolite and dacite tuff, cover about 15% while sedimentary rocks, including the Apache Group, cover approximately 29%. Recent alluvium occurring along drainages covers 7% and diabase covers 6% of the allotment (Arizona Geological Survey, 2002). All soils within the allotment are in the Low Sun Mild (LSM) Terrestrial Ecosystem Unit Inventory climatic gradient (Terrestrial Ecosystem Survey Handbook, Appendix B).

The dominant soil subgroups are: Torrifluvents and Ustifluvents (recent soils along drainages); Ustic Haplargids LSM, 2 (desert soils with well developed profiles), the most common soil associated with the Sonoran Desert vegetation; Aridic Haplustalfs LSM, 3 (moderately deep to deep well developed soils) and Lithic Haplustalfs LSM, 3 (shallow soils) associated with semi-arid grasslands; and Typic Haplustalfs LSM, 4 and Lithic Haplustalfs LSM, 4 associated with either chaparral or woodland vegetation. The soils associated with chaparral vegetation tend to be coarser textured than soils associated with woodland vegetation. Semi-desert grassland soils on gentle slopes tend to be fine textured.

Slope

Topographical features range from nearly level alluvial fans to rugged steep slopes and canyons. Slope ranges are those assigned to the Terrestrial Ecosystem Unit Inventory map units. Slopes of up to 40 percent are considered suitable for livestock grazing. Division of slope classification for livestock utilization analysis is a way of ensuring adequate forage production is available and within reach of livestock. Livestock tend to eat vegetation closer to water sources and on flatter ground first before moving further away from water and up steeper slopes. So although cattle can climb steep slopes and will to chase their favorite plants, we measure use and production on less steep ground since we expect lighter and not representative use on areas above 60 percent slope. According to Holechek (1988), grazing areas with slopes greater than 60 percent receives little to no use by cattle.

Table 3: Acres by Allotment pasture and Percent Slope

Pasture	0-15%	15-40%	40-80%	80%+	Total
Big Pasture	502	605	154	0	1,261
F. S. Pasture	57	233	179	1	471
Hicks Pasture	148	553	627	34	1,361
Holly Pasture	258	740	400	16	1,414
Hope Pasture	601	1,870	1,120	52	3,643
Horseshoe Bend Pasture	2,117	4,453	3,378	186	10,135
Kenny Pasture	236	756	463	14	1,468
Lower Devore Pasture	665	912	455	65	2,096
Murphy Pasture	692	1,219	457	6	2,374
North Steer Pasture	232	673	598	84	1,586
Ortega Pasture	1,775	3,501	3,560	485	9,321
Private	1,204	334	101	3	1,641
Rip Pasture	851	762	239	3	1,855
Shute Springs Pasture	3,615	7,106	4,407	588	15,715
Shute Springs Trap	66	146	71	30	314
South Steer Pasture	740	1,138	406	8	2,291
Upper Big Pasture	135	514	182	0	831
West Pasture	939	860	278	3	2,081
Windmill Pasture	1,579	2,737	1,278	54	5,648
Yellow Pasture	117	533	650	27	1,328
Total	**16,528**	**29,646**	**19,001**	**1,661**	**66,836**
Percent	**25%**	**44%**	**28%**	**3%**	**100%**

Soil Condition

Soil condition was evaluated by using a combination of field inspections, information from the Terrestrial Ecosystem Unit Inventory survey digital elevation models, aerial photo interpretation, and topographic maps. The soil condition represents an approximation of the allotment. Interpretations were based on historical livestock use patterns and slope characteristics.

It was observed in the field that zero to 15 percent slopes had high impacts. Fifteen to 40 percent slopes had mostly moderate to high impacts except rocky areas where impacts were low. Most slopes steeper

than 40 percent had low impacts. Historical accounts[1] from 1929 to 1932 document Allotment overuse and deteriorating range conditions, noting advanced erosion in some areas including most granitic soils. This indicates that areas with less than satisfactory soil condition could be the remaining consequences of past management practices. **Table 4** lists a summary of current soil conditions for the Hicks-Pikes Peak Allotment.

Table 4: Soil Condition of Allotment Pastures in Acres

Pasture	Satisfactory	Impaired	Unsatisfactory	Unstable	Private	Total
Big Pasture	392	52	817			1,261
F. S. Pasture	349	122				471
Hicks Pasture	1,180	106	75			1,361
Holly Pasture	702	658	55			1,414
Hope Pasture	1,621	1,439	548	35		3,643
Horseshoe Bend Pasture	4,222	1,670	2,550	1,693		10,135
Kenny Pasture	984	471	13			1,468
Lower Devore Pasture	502	314	1,281			2,096
Murphy Pasture	1,684	688	2			2,374
North Steer Pasture	781	425	343		37	1,587
Ortega Pasture	4,346	1,506	2,215	1,254		9,321
Pvt/No Grazing	89	41	76		1,436	1,641
Rip Pasture	559	216	1,081			1,855
Shute Springs Pasture	9,379	2,406	3,597	333		15,716
Shute Springs Trap	271	36	6			314
South Steer Pasture	523	260	1,508			2,291
Upper Big Pasture	278	353	201			831
West Pasture	379	222	1,480			2,081
Windmill Pasture	1,763	2,660	1,225			5,648
Yellow Pasture	1,058	132	122		16	1,328
Total	**31,062**	**13,777**	**17,195**	**3,316**	**1,489**	**66,838**

Soil quality assessment (soil condition) monitoring is necessary to determine watershed condition and long-term soil productivity (FSH 2509.18-99-1). Soil condition monitoring is completed during the Terrestrial Ecosystem Unit Inventory mapping process. It is an evaluation of soil quality based on an interpretation of factors which affect vital soil functions. These functions are: the soils' ability to hold and release water (hydrologic function), the ability of the soil to resist erosion and degradation (soil stability), and the soils' ability to accept, hold and release nutrients (nutrient cycling).

Excessive soil compaction can impede the root growth of plants. With more limited root growth, this can decrease the plant's ability to take up nutrients and water. In dry years, soil compaction can lead to stunted, drought stressed plants due to decreased root growth. The "A" horizon of the soil is also important to evaluate. This soil layer, also known as the "top soil", is the layer many plants' roots grow in and provides most of the nutrients the plants need to grow. The process of recycling nutrients in the soil to plants is called nutrient cycling.

[1] These historical accounts can be found in the project record.

Soils are evaluated and assigned a soil condition category, (i.e. satisfactory, impaired, unsatisfactory, or unstable), which is a reflection of soil function. On the Hicks-Pikes Peak Allotment:

- Fourty-eight percent of the allotment, or 31,062 acres, is in the **satisfactory soil condition class**. These soils are generally found on steeper slopes or areas that are very rocky and inaccessible for cattle. Generally, these soils have not been heavily impacted and have high effective vegetative ground cover. Plant species' density and diversity are high.
- Twenty-one percent of the soils, or 13,777 acres, are predominantly **impaired soil condition**. Most of these soils occur on slopes ranging from 15 to 40 percent or on rocky flats. Specifically, these have slight to moderate soil compaction and have lost part of the original "A" horizon through moderate sheet and rill erosion. These soils have not been compacted as much as the heavily used soils in unsatisfactory condition. Nutrient cycling is limited as well. Vegetation diversity and species composition is relatively low. Few perennial grasses are present, which can limit the supply of organic matter and nutrients, through litter buildup, to the soil below. Vegetation has shifted towards more annual forbs and annual grasses with poor distribution of litter in the interspaces.
- Twenty-six percent of soils, or 17,195 acres, are **unsatisfactory soil condition class**. These soils have high amounts of surface compaction and poor soil porosity and root distribution resulting in moderate to high amounts of sheet, rill, and gully erosion, very poor diversity, density, and composition of perennial grasses with little litter cover. Gully erosion is most conspicuous on granitic soils under chaparral vegetation. The lack of perennial grasses and litter cover is limiting the ability of these soils to rebuild their supply of organic matter. For these soils to recover, the compaction layers must be allowed to achieve normal compaction (i.e. a bulk density within 15 percent of normal) by limiting hoof impact, especially when soils are wet. A buildup of organic matter, from both surface litter and a dense network of plant roots, primarily perennial grasses, is also critical for recovery. Much of the unsatisfactory soil condition appears to have been caused by historical grazing impacts, however, current management practices could also be slowing or preventing recovery.
- Five percent of soils, 1,489 acres, are **unstable**. These areas have a high erosion risk and occur on steep to very steep slopes.

Desired Conditions

Recovery times for soils in desert ecosystems can be extremely slow. This is attributed to the fact that deserts are generally considered to have both low resistance and resilience to disturbance, though, it is expected that resistance and resilience to disturbance can vary among deserts and among ecosystems in general (Belnap 2002). Rates of recovery will differ depending on several factors such as magnitude of past soil loss, inherent soil properties, current vegetation ground cover, and the type of ecosystem.

According to Forest Service Manual 2550.2, the desired conditions for soils are to "maintain or restore soil quality on National Forest System lands. Manage resource uses and soil resources on NFS lands to sustain ecological processes and condition so that desired ecosystem services are provided in perpetuity." Further, the Forest Plan indicates that projects should improve soil productivity (p. 19).

Ecological land units are assigned a soil condition category which is an indication of the status of soil functions. Soil condition categories reflect soil disturbances resulting from both planned and unplanned

events. Current management activities provide opportunities to maintain or improve soil functions that are critical in sustaining soil productivity (Forest Service 2012).

It would be desirable for all soils within the allotment to be in satisfactory; however, soil improvement may take longer than anticipated for this authorization. Therefore, the desired condition would be to maintain soils currently in satisfactory condition and to manage for upward trend of the soils that are in impaired condition within grazing management practices.

Water Resources

This project area includes the Hicks-Pikes Peak allotment on the Globe Ranger District. The allotment is located along the Salt River to the north, the Apache Peaks to the east, Pinal Creek and Granite Basin to the west, and a variety of hills, washes, and basins to the south. The project area lies within twelve 6th code watersheds.

There are approximately 64 miles of perennial and intermittent streams within the project area that support approximately 2,720 acres of riparian vegetation mapped as part of the regional Riparian Mapping Project (RMAP) (Triepke, et al, 2013). There are an additional 280 miles of named and unnamed streams (delineated as blue lines on USGS 1:24,000 scale topographic maps) within the allotment. These unnamed streams are the ephemeral tributaries to the perennial and intermittent streams and are primarily headwater streams dominated by upland vegetation and ephemeral channels dominated by upland and drier riparian vegetation. They provide important functions relating to water quantity, water quality, flood regime, hydrological connectivity, riparian vegetation and wildlife habitat (Meyer et al. 2003, Levick et al. 2007) within the watershed.

According to US Army Corp of Engineers (2017), ephemeral, intermittent and perennial streams are defined as follows:

- ***Ephemeral stream:*** An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

- ***Intermittent stream***: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

- ***Perennial stream:*** A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

Historic Conditions

The existing condition of watersheds, stream channels, and riparian areas has been affected by many factors, both natural disturbances, including drought, fire, and floods, and human activities, including fire suppression, mining, and grazing.

Historic over-grazing has had the most extensive effect on watersheds, stream channels and riparian areas. Cattle were introduced in the late 1870s following the Civil War and the subjugation of the Apaches to reservations. By 1891, one and a half million cattle had been brought to Arizona (Allen 1989). The range was severely overstocked. The trails formed by livestock on the uplands and next to the stream channels were the beginnings of gullys. Trampling and compaction in the uplands caused deterioration of the vegetation and soils. Vegetation along stream channels was removed by cattle. In 1892-93 a severe drought occurred that caused the death of many cattle and had a further negative effect on an already deteriorated range (Allen 1989). There have been many accounts of the overgrazing and subsequent drought and flood events that occurred throughout central and southeastern Arizona which resulted in arroyo cutting and washed out stream channels (Wagoner 1949, Dobyns 1981).

Mining activity had additional effects on the watersheds. In 1875, silver was discovered in nearby Richmond Basin. Subsequently, the Mack Morris Mine was established and a ten-stamp mill was installed on Pinal Creek to reduce its ore (Dobyns 1981). There were also smelters and mills in operation in Globe and Miami. In the early 1880s, when the production of copper surpassed silver and gold, three water jacket furnaces were built on Pinal Creek (Dobyns 1981). All these mining operations required huge amounts of wood for fuel and building purposes which resulted in severe removal of timber in the surrounding areas (Dobyns 1981), including the Hicks-Pikes Peak Allotment area. Pinal Creek, within the allotment, was also subjected to placer mining (Dobyns 1981).

When rains came, there was little ground cover left to slow the water. In February 1891 two large floods occurred in the watershed south of Globe, Arizona, and had a devastating effect on the channels in the local Pinal Creek watershed (Dobyns 1981). Overland flow and subsequent erosion of the uplands overwhelmed streams. Soil surface layers and large areas of floodplain were washed away. Stream channels downcut, widened, and lost connectivity with the underground water table, leaving the wide, unstable, dry channels existing today.

Range inspection reports for this project area indicate that all of the allotments had been severely over-grazed by the 1940s[2]. Cattle concentrated in the riparian channel bottoms, flat areas, and near water. There were few off-channel waters so the cattle depended on springs, streams, and the Salt River for water. Many of the springs were fenced and used as traps, causing severe erosion and loss of vegetation. A 1944 Forest Service range inspection includes a lengthy report that contains information about several of the channels on the neighboring Radium Allotment to the south. The report states that older stockmen claimed the dry washes, at one time, supported sodded-over bottoms and the small gravelly streams ran nearly yearlong. By 1944, the channels were getting washed out by periodic floods because the lack of upland vegetation condition and cattle trailing down channels were causing damage. The condition of Negro Wash, which also occurs on the neighboring Radium Allotment, was “deplorable”. It was depleted of perennial grasses, though some bunch grasses were present (possibly deergrass).

[2] These Forest Service Range Management Planning (2210) files are located at the Tonto National Forest Supervisor’s Office in Phoenix, Arizona.

Precipitation

Climate in the project area is characterized by a bimodal precipitation pattern with about 60 percent occurring as frontal systems in the winter from December to March and about 40 percent occurring as monsoons in the summer from July to September. Summer storms can be more intense than winter storms but are generally of shorter duration and smaller aerial extent. August is typically the wettest month and May and June are the driest.

Average annual precipitation in the allotment is estimated to range from 15 inches along parts of the Salt River and Pinal Creek to as much as 27 inches on the Apache Peaks. Average annual precipitation over the entire allotment is estimated at about 17.5 inches. These estimates are derived from the Parameter-elevation Regressions on Independent Slopes Model database using the time period of 1981-2010 (Oregon State University, 2014).

The nearest climate stations to the project area with current data are Miami and Roosevelt 1WNW. The period of record for Miami is 1914-present and the average annual precipitation is 18.8 inches (WRCC 2017). The data indicate five of the last ten years (2006-2015) had below average precipitation, with 2006 and 2011 the driest with less than 70 percent of average, three years (2010, 2013 and 2015) were above average, and two years had missing data (WRCC 2017).

The period of record for Roosevelt 1WNW is 1905-present and the average annual precipitation is 15.7 inches (WRCC 2017). The data indicate four of the last ten years (2006-2015) have had below average precipitation, with 2009 being less than 70 percent of average. Two years (2008 and 2010) had above average precipitation, and three years were missing data (WRCC 2017). For the same years, the temperature was above average five of the years, average three of the years, and missing data two of the years (WRCC 2017).

Recent Flood Events

Stream channels are dynamic systems that are constantly being changed by the water and sediment flowing through the system. These changes obey the natural forces of gravity, friction, and fluid cohesion (Janicke 2000). A stable or properly functioning stream channel is dependent on its ability to resist the forces of erosion and will maintain its dimensions (width to depth ratio, gradient, and sinuosity) over time without excessive erosion or deposition (Barrett 1993, Rosgen 1996, Mason and Johnson 1999, Janicke 2000). A healthy riparian ecosystem contributes to channel stability by increasing resistance, thereby reducing flood peaks, trapping sediment and increasing groundwater recharge (Briggs 1996). Modifications that cause removal of vegetation will lower the channel’s resistance to erosion and lead to an increased frequency and magnitude of flood impacts (Trimble and Mendel 1995, Rosgen 1996, Janicke 2000).

Over half of the stream channels assessed in the project area are in impaired or unstable condition (Mason and Johnson 1999) in large part due to lack of riparian vegetation. These streams are less able to resist the erosive forces of flood waters, even during smaller events of lower water velocities (Janicke 2000). When large flood events with high water velocities occur, the channels experience severe erosion and/or aggradation causing heavy loss of riparian vegetation.

In late January 2008, a weather system off the west coast moved into Arizona that tapped tropical moisture from the south. It brought high precipitation along the Mogollon Rim and the Upper Gila River watershed that caused flooding (Stall and Lader 2008). Stream gages within and near the project area recorded high flows (Table 5). In mid-January 2010, three low pressure systems passed through Arizona within a week causing intense rainfall and record flooding south and west of the Mogollon Rim (NOAA 2010). Stream gages within and near the project area recorded record high flows. Given the initial condition of the stream channels and the magnitude of the flood events, some of the streams within the project area have lost riparian vegetation, downcut, eroded, and experienced excessive deposition.

Table 5: Peak Flow Data for Gages Within and Near the Project Area (USGS 2011a).

Gage	Date	Flow (cfs)	Comment
Salt River near Chrysotile	1-28-2008	55,300	6th highest flow of record
	1-22-2010	37,000	15th highest flow of record
Salt River near Roosevelt	1-28-2008	81,300	9th highest flow at the time
	1-22-2010	88,300	8th highest flow of record
Cherry Creek near Globe	1-28-2008	10,300	3rd highest flow at the time
	1-22-2010	17,700	highest flow of record
Pinal Creek at Inspiration Dam	1-28-2008	2520	5th highest flow at the time
	1-22-2010	5330	2nd highest flow of record

Water Quality and Quantity

Existing Conditions

Presently, of 374.14 miles of stream channels, including those named on the USGS topographic maps and unnamed streams identified as supporting riparian vegetation on the National Wetland Inventory maps, there are approximately 70 miles of stream channels that support obligate riparian vegetation. Based on Forest Service reports and historic conditions, the extent of riparian vegetation has been reduced (Croxen 1926, Haskett 1935, Heffernan 2008).

On the Hicks-Pikes Peak Allotment, most of the stream channels evaluated in the field are in unstable or impaired condition. Riparian areas and springs have been relied upon as the primary source of livestock water for many years causing stream channels and adjacent riparian areas to receive concentrated grazing pressure.

Key Reaches

A stream reach is defined as any length of stream between two points. Key reaches, similar to upland key areas (Interagency Technical Team 1996), are stream channels, springs, or riparian areas that are representative, responsive to changes in management, accessible to livestock, and contain key species. Key reaches are designated monitoring areas defined by Burton et al. (2011) as the location where monitoring occurs. The 65 riparian areas identified in Table 6 have the potential to improve within a relatively short time period (10 years) and have been identified as key reaches for this analysis. Table 6 displays the key reaches, some of which were rated using a condition assessment developed on the Tonto National Forest (Mason and Johnson, 2000), and whether they currently have enough available, palatable riparian vegetation to provide for statistically valid annual use monitoring as a management tool.

Table 6: List of key reaches within pastures in the Hicks Pikes Peak Allotment and summary of conditions.

Pasture	Key Reach	Stream Condition	Manage by Monitoring
Holly	Bluff Spring	not assessed	Yes
Kenny	Devore Wash	Impaired	No
Rip	Hicks Wash	Severely Impaired	No
Ortega	Salt River	not assessed	Yes
Lower Shute Springs	Salt River	not assessed	Yes
Horseshoe Bend	Sycamore Canyon	Unstable	No
Horseshoe Bend	Mud Springs Wash	Unstable	No

Existing and desired conditions of these key reaches are discussed by pasture below. Existing conditions for each stream reach may include condition assessment (Mason and Johnson 1999), stream type (Rosgen 1996), or monitoring data. Key reaches are approximate locations for monitoring. The Salt River is the largest stream that flows through the allotment.

The availability of developed water sources, away from riparian areas, within a pasture can affect the amount of time cattle may spend in these areas. The water sources for each pasture that contains a key reach are described, including state file numbers for those which the Tonto National Forest has water rights or claims. Many of the water developments have been inventoried and data is available in Table 12 in Appendix B by state file number.

Salt River

The Salt River originates at the confluence of the White River and the Black River on the boundary of the White Mountain Apache and San Carlos Indian Reservations. The Salt River forms the boundary between the Forest and the White Mountain Apache Indian Reservation. About a half mile past Yankee Joe Canyon it passes the Reservation boundary and flows entirely on the Tonto National Forest.

Valley widths vary from narrow (less than 50 feet) to broad (300 feet) with occasional sections reaching 600 feet. High energy flows are common in the canyon. In some locations, the Salt River is narrowly confined by rock walls with no potential to support riparian vegetation. However, some reaches have banks capable of supporting stands of riparian vegetation. Where these riparian reaches are accessible, they are considered key reaches for this project and are further described by allotment and pasture.

The history and amount of livestock use along the river is generally not known. Boating trips were conducted by the district in May 1999 (from Gleason Flat to the State Route 288 bridge) and April 2011 (from the second camp on the reservation to the State Route 288 bridge) to document the existing condition, accessibility by cattle, and livestock grazing use. Inspection notes were written by Kristen McBride (Riparian Monitoring Coordinator) in 1999 and by Jamie Wages (Range Staff, Globe) in 2011. Their data, along with some limited monitoring and site visit data, were used in this report.

Although the Salt River is divided into reaches by pasture, there are no fences across the river to prevent cattle from accessing the river in adjacent pastures. Once in the river, cattle may access up and down stream until reaching natural barriers.

Wild and Scenic Rivers

The portion of the upper Salt River that flows through the allotment has been classified as potentially eligible for inclusion into the National Wild and Scenic Rivers System (USDA 1993). The Upper Salt River flows through remarkable canyons and is nationally known for its white water rafting. The segment of the Salt River within the allotment is proposed for classification as a Wild River. It begins at the west boundary of the Fort Apache Indian Reservation and extends to the southwest boundary of the Salt River anyon Wilderness. Outstandingly Remarkable Values (ORVs) identified include scenic, geologic, wildlife, recreational, and ecological values. Criteria established to describe these ORVs are provided in Appendix B. Forest Handbook direction is to manage potential wild and scenic rivers to protect their indicated ORVs (Forest Service Handbook 1909.12, Chapter 80).

Available Water Sources

The Tonto National Forest Geographic Information System (GIS) perennial stream layer identifies Pinal Creek, the Salt River and short reaches of Mud Springs Wash, below Jump-off Spring, and Sycamore Canyon below Sycamore Spring, as perennial on this allotment. Much of the water on this allotment is provided by springs and wells located in drainages. The key reaches on this allotment have high potential to support lush riparian areas, but are used as water sources and typically receive high use.

Holly Pasture

This pasture is watered by two springs (state file numbers 36-19009 and 36-18999) and one well (state file number 55-601074).

Bluff Spring.

Bluff Spring is located in Blevens Wash. The site was visited in 2006. A short reach of the channel was dominated by a dense patch of deergrass with a few cottonwood and Goodding's willow trees. The deergrass was over five feet in height. Seep willow and sedges were also present. The concrete trough in the channel was dry. It was speculated that the cattle were watering at Laurel Spring, a quarter mile to the south in a tributary, and Bluff Spring received little use.

Kenny Pasture

This pasture is watered by four springs (state file numbers 36-19002, 36-25344), which all occur in drainages.

Devore Wash.

Devore Wash originates in Granite Basin and flows north approximately 8.2 miles through the west side of the allotment to its confluence with Pinal Creek. Forest Road 225 lies in the wash for about 1.3 miles from State Route 188 upstream, through the West Pasture. Forest Road 225 leaves the wash near the pasture boundary. Devore Wash flows about 1.4 miles through the Kenny Pasture and is the primary source of water in this pasture. It is mostly perennial, supported by springs, and flows in a narrow valley bottom less than 50 feet wide. The channel is a Rosgen "F" type stream, wide and shallow, lacking channel or floodplain features, and predominantly comprised of sand and gravel sized sediments[3].

[3] The characteristics of the Rosgen classification system are described in more detail in Appendix A.

Murphy Spring is located just south of the southern pasture boundary in the Murphy Pasture. The trough, which is shared by the two pastures, is located next to the creek. This spring supplies perennial flow in the upper reach of Devore Wash in this pasture. The dominant riparian tree size classes are saplings and poles of cottonwood, Goodding's willow and sycamore. There are less frequent old trees and seedlings. Deergrass is absent near the spring, but occurs downstream where the channel becomes dryer. It is speculated that the deergrass has been extirpated near the spring. Sedges and rushes are also present.

Downstream of this quarter mile reach, the channel becomes intermittent for about half a mile. The intermittent reach supports most of the riparian species observed in the wetter reaches, but with lesser cover and density. Below this, the channel again becomes perennial and supports much the same vegetation as near the spring, but with a higher cover of deergrass. There were also short reaches of no impact where the channel became deep & narrow with deergrass forming banks.

Visits between 2004 and 2007 to monitor use near the spring showed light use on the few seedlings and there was no deergrass to monitor. In 2009, use was estimated on the whole reach. Use on the vegetation was variable, but trailing and trampling were excessive. Cattle were concentrated in the narrow riparian area, and in the wettest areas, channel and floodplain features were obliterated.

This stream has high potential, but is vulnerable because of the narrow valley which concentrates use. Reaches around the wetter areas could be expected to increase in riparian species diversity and cover, and extend up and downstream with time.

Rip Pasture

This pasture is watered by two springs (state file numbers 36-24029, 36-18962) and one well (state file number 55-601075).

Hicks Wash.

Hicks Wash originates in the Murphy Pasture and lies entirely within the allotment except for a quarter mile at the confluence with Pinal Creek, which is on private land. It flows to the south of and parallel with Devore Wash, approximately 1.8 miles through this pasture. Forest Road 1120 lies in the lower half mile of the wash, which is dry, and exits at Rockhouse Trail Spring. In 2010, the old cottonwood at the spring had fallen over and there were a few seedlings present. There are some pole and large size cottonwoods upstream from the spring near an old dam. Upstream from the dam the channel becomes dry.

Moving upstream from the dry reach, the valley narrows and the channel becomes more defined. Rip Spring is located just upstream of the western pasture boundary and provides intermittent flow to the wash for approximately a half mile below the pasture boundary. The channel is an "F" type in severely impaired condition due to lack of vegetation and excessive sediment in the channel. It supports spotty sapling and pole size cottonwoods, seep willow, and desert baccharis where water is forced to the surface by bedrock. There is one large patch of coyote willow. The herbaceous component is lacking and consists of less than half a dozen deergrass plants. There was very little use on the vegetation, but trailing along the channel was excessive and was preventing the channel from forming banks.

Ortega Pasture

This pasture is watered by seven springs (state file numbers 36-19004, 36-19000, 36-24032, and 36-25341), two stock tanks (state file numbers 38-25144 and 38-25143), and one well (state file number 55-600960). However, this pasture has not been used for grazing for more than ten years.

Salt River.

With current range infrastructure, if this pasture were grazed, Cattle would have access to the river and could cross at low flows in this pasture at the Cherry Creek confluence and Horseshoe Bend.

Lower Shute Springs Pasture

The only water in this pasture is the Salt River. However, this pasture has also not been used for grazing for more than ten years.

Salt River.

With current range infrastructure, if this pasture were grazed, cattle would have access to the river at Redmond Flats, Redmond Wash, and Shute Springs Creek. Signs of cattle were observed in the Redmond Wash area in April 2011.

Horseshoe Bend Pasture

This pasture is well watered by four stock tanks (state file numbers 38-23830, 38-23828, 38-23831, and 38-23834), five wells (state file numbers 55-601070, 55-600959, 55-600958, 55-600957), and 14 springs (state file numbers 36-24028, 36-18998, 36-24038, 36-18997, 33-94723, 36-19003, 36-19008, 36-105425, 36-25341). Some of the springs in this pasture occur in pairs and the Forest water right claims only cover one spring of the pair.

Sycamore Canyon.

Sycamore Canyon originates northwest of Apache Peaks and flows north for approximately 6.6 miles to its confluence with the Salt River at Horseshoe Bend in the Ortega Pasture. It is one of three main tributaries that enters the Salt River at Horseshoe Bend from the south, the other two being Grapevine Canyon and Mud Springs Wash. Just over half of the three miles through this pasture are ephemeral, with the lower mile and a quarter being perennial or perennial-interrupted flow supplied by springs. The last quarter mile drops into a steep narrow canyon. The floodplain of Sycamore Canyon is encumbered by Forest Road 219 for approximately two miles which leaves the floodplain at Sycamore Spring. The road is causing sedimentation and impacts to riparian vegetation.

The reach above the spring is a wide, shallow, Rosgen “F” type with no channel features. The riparian vegetation consists mainly of thick stands of seep willow, with occasional willows and cottonwoods. In some years there is a thick carpet of seedlings.

Below the spring, the channel contains bedrock and boulders. In 2008, the channel was a Rosgen “C” type. There was a small section that was somewhat inaccessible to cattle that supported thick deergrass, sycamore, cottonwood, willow, and seep willow. In 2012, the channel was highly trampled and is now an Rosgen “F” type with no channel features. Gravel size sediment fills the entire channel. This may be partly due to the recent floods. The site is dominated by occasional pole size and larger willows, cottonwoods, sycamores, and seep willow.

The deergrass is absent from both reaches, and there is no herbaceous vegetation and little regeneration of woody species. There was a high amount of breakage on the seep willows. Both reaches were visited several times and showed moderate to high use on seedlings and heavy trailing and trampling in 1992, 2000, 2008, 2009, 2010, and 2012. There was no use in 2001.

Downstream from the spring, the channel dries and supports much the same vegetation as above, with lower density.

Mud Springs Wash.

Mud Springs Wash originates south of Rockinstraw Mountain, flows around it to the east and then north to its confluence with the Salt River at Horseshoe Bend, approximately five miles. The upper half of the wash, in the Horseshoe Bend Pasture, is mostly ephemeral and contains springs that support perennial flow and riparian vegetation.

Near the boundary of the Horseshoe Bend Pasture and the Ortega Pasture, Lower Mud Spring supports a substantial riparian area. In June 2007, when the spring was inventoried, vegetation included sycamore, willow, seep willow, deergrass, and sedges. Cattle were present and the channel and banks were highly trampled. In 2008, there was no herbaceous vegetation and seep willow and other baccharis species dominated. The soil near the spring was impacted by cattle. In 2012, there were no herbaceous species, no regeneration of woody species, and the channel and floodplain were dominated by seep willow with some desert broom. Both species are unpalatable but showed 100 percent use and high breakage of branches. Spotty pole size cottonwoods and willows occur in the channel. Most of the channel consists of gravel size sediment, but there is soil near the spring which was highly impacted. The channel is a Rosgen "F" type in unstable condition due to lack of vegetation and channel features. ATV tracks are also evident in the channel.

Water from the spring is piped downstream to a trough near the road, which supplies water to both the Horseshoe and Ortega Pastures. The drinker was full in 2012 and remains full in 2017.

Water Quality

The Arizona Department of Environmental Quality (ADEQ) evaluates the water quality status of waters within the state in a 2016 Clean Water Act Assessment Report (2016a) that is prepared every two years. Three water bodies within the project area have been monitored by ADEQ:

- Salt River from Canyon Creek to Cherry Creek. Designated uses for this section include aquatic and wildlife-warm water fisheries, full body contact recreation, fish consumption, agricultural irrigation, and agricultural livestock watering.
- Salt River from Pinal Creek to Roosevelt Lake. Designated uses for this section include aquatic and wildlife-warm water fisheries, full body contact recreation, fish consumption, agricultural irrigation, and agricultural livestock watering.
- Pinal Creek from lower Pinal Creek WTP discharge to Salt River. Designated uses for this section include aquatic and wildlife-ephemeral water fisheries and partial body contact recreation.

The Salt River from Canyon Creek to Cherry Creek was rated as impaired for Selenium that violates the aquatic and wildlife warm water fishery standard in both the 2012 and 2014 (ADEQ, 2014) and Draft 2016 (ADEQ, 2016a) assessment reports. This reach of the Salt River is considered a low priority for

development of a Total Maximum Daily Load (TMDL) analysis for determining the source of the impairment and recommended treatments to bring the reach into compliance with state standards.

The Salt River from Pinal Creek to Roosevelt Lake, just downstream of the project area, was rated as impaired in the 2012 and 2014 Assessment Report (ADEQ, 2014) due to exceedances of the suspended sediment, nitrogen, and phosphorus criterion for aquatic and wildlife-warm water fisheries and the *E. coli* criterion for full body contact recreation. The Draft 2016 Assessment report recommends delisting suspended sediment, nitrogen, and phosphorous from the impaired waters list. However, it also recommends continuing the Impaired designation for *E. coli*. This reach is identified as a medium priority for conducting a TMDL study. (ADEQ 2016b). This TMDL study will describe where the suspected sources of the *E. coli* are originating from, how much these sources are contributing, and what corrective actions are needed to reduce the contribution of this contaminant to acceptable levels. The Forest Service would be a cooperator in this process. All other uses in this area are rated as Attaining (not impaired).

Lower Pinal Creek was first listed as Impaired by ADEQ in 1988 for copper, manganese, zinc, and low pH (ADEQ 2011a). Subsequently, a water treatment plant was constructed on Pinal Creek at State Route 188, groundwater is pumped from the creek to intercept a plume of polluted groundwater (resulting from historic mining activities) migrating through the alluvium beneath the creek, the water is then treated and a portion of it is returned to the creek. Pinal Creek was delisted in 2002 (ADEQ 2011a). Designated uses of the creek were changed from aquatic and wildlife warm water to an aquatic and wildlife effluent-dominated stream between the 2012 and 2014 assessments to the most recent draft 2016 assessment[4]. The reach of the creek from the treatment plant to the Salt River was assessed as Attaining Some Uses in the 2012 and 2014 assessment but is assessed as inconclusive in the Draft 2016 assessment due to an exceedance of the copper standard that violates the partial body contact and the aquatic and wildlife effluent dominated stream standard.

Desired Conditions

The most common conditions limiting proper functioning condition of stream channels in the project area are high width-depth ratios, excessive erosion or deposition, and lack of riparian vegetation (elements of Mason and Johnson 1999). Restoration and recovery of stream channel stability and proper functioning condition is dependent upon restoration and recovery of riparian vegetation.

Based on direction from FSH 2209.13 (Grazing Permit Administration Handbook) Chapter 90 (2007), specific statements of desired condition should be developed for each allotment within the context of the Forest Plan. The following project-specific desired condition statements have been developed for the riparian areas and stream channels in the project area, with the intent of achieving stream channel proper functioning condition (Barrett et al, 1993).

[4] Designated uses for non-ephemeral, unlisted tributaries above 5000 feet are aquatic and wildlife-cold water fisheries, full body contact recreation and fish consumption. Designated uses for non-ephemeral, unlisted tributaries below 5000 feet are aquatic and wildlife-warm water fisheries, full body contact recreation and fish consumption. Designated uses for ephemeral, unlisted tributaries are aquatic and wildlife-ephemeral water fisheries and partial body contact recreation (A.A.C. R18-11-105).

Desired conditions for key reaches include both short-term and long-term timeframes. The most important short-term desired conditions are to:

- Maintain residual herbaceous vegetation along the greenline or streambank whenever precipitation is expected;
- Re-introduce riparian vegetation if native riparian species are absent;
- Minimize the annual impacts to seedling and sapling riparian woody species; and
- Limit physical impacts to alterable streambanks and greenlines.

The most important long-term desired conditions are to:

- Optimize riparian tree and shrub establishment, especially following episodic, regional winter storms;
- Increase the density, vertical and horizontal canopy cover of woody riparian tree species;
- Increase the proportion of obligate and facultative riparian species;
- Maintain or increase canopy cover of herbaceous species to at least 50 percent (or five percent to 25 percent for reaches now at trace to one percent);
- Decrease the greenline to greenline width;
- Optimize the establishment of floodplains and streambanks; and
- Improve stream channel function and stability.

Reaching desired conditions for riparian areas and stream channels will depend not only on management activities, but on climatic events. Both drought and floods have the potential to affect riparian areas and stream channels. High flows (greater than ten year recurrence interval) are likely to scour impaired or unstable channels. Even moderate flows (about two year recurrence interval) could cause unstable channels to widen or incise.

For water quality, the desired condition is to maintain criterion that are currently rated as Attaining and improve criterion currently rated as Impaired by to continuing to comply and cooperate with the Arizona Department of Water Quality.

Watersheds

Existing Conditions

In 2010, a national effort was completed by the Forest Service to assess the condition of all 6th code watersheds on National Forest System land (Potyondy and Geier, 2011). Sixth code watersheds are typically 10,000 to 40,000 acres in size (Figure 4).

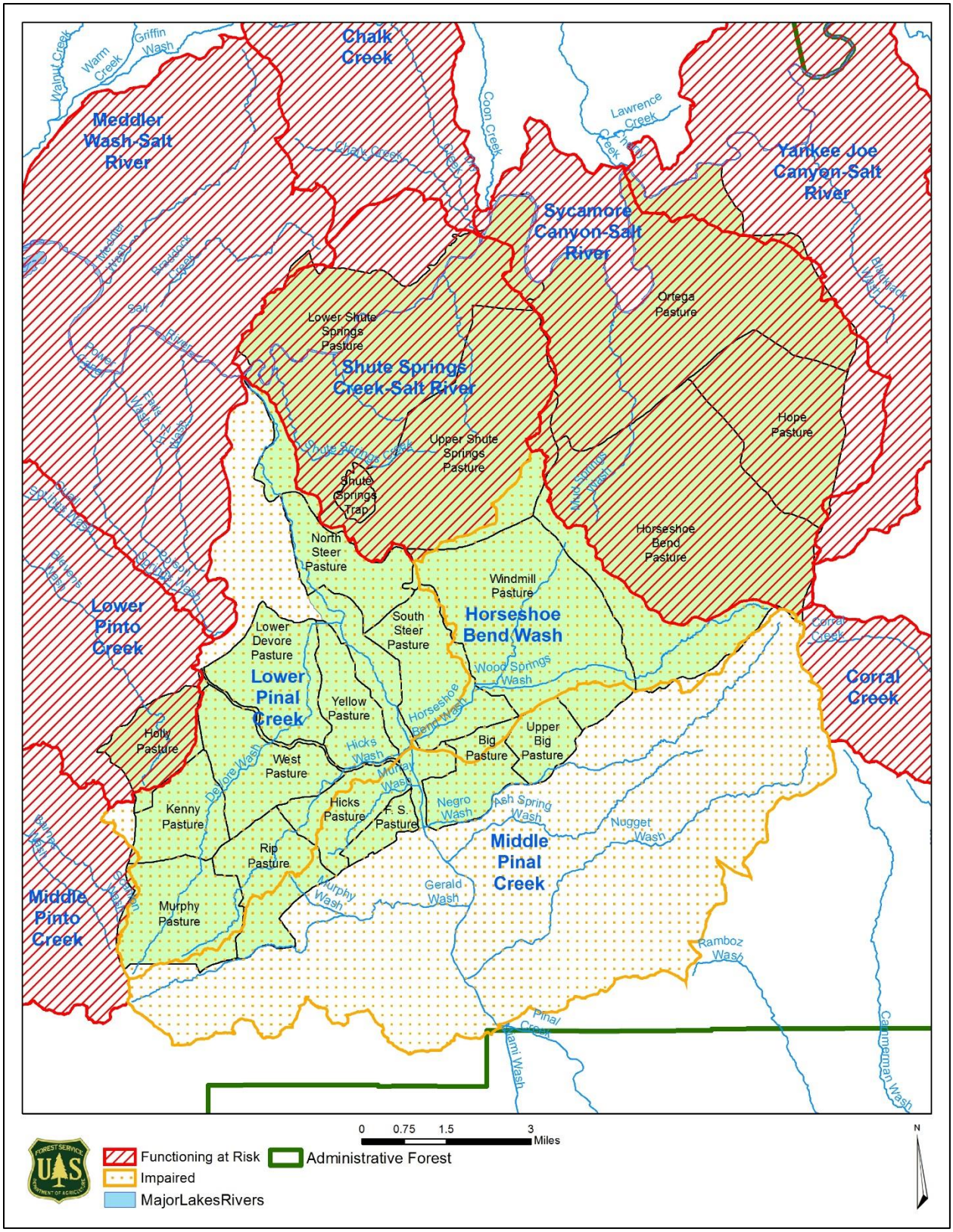

Figure 4: Location and Condition of Sixth Code Watersheds in the Project Area

Twelve indicators were assessed including: water quality, water quantity, aquatic habitat, aquatic biota, riparian vegetation, road and trail network, soil, fire regime or wildfire effects, rangeland vegetation, terrestrial invasive species, forest cover, and forest health. Each indicator has its own definition of Functioning, Functioning at risk, and Impaired and was assessed a point value based on its condition. Each 6th code watershed was given an overall rating of Functioning, Functioning at risk, or Impaired based on the indicator scores. Eleven 6th code watersheds lie at least partially within the Hicks Pikes Peak Allotment boundary and the results of the assessment for these 6th code watersheds are listed in Table 7 and shown in Figure 4. The Sycamore Canyon-Salt River watershed has the greatest proportion of the project area within a 6th code watershed.

Table 7: Sixth Code Watersheds Located in the Hicks-Pikes Peak Allotment

Watershed Name	Watershed Number	Watershed Acres Within Allotment	Watershed Condition
Yankee Joe Canyon-Salt River	150601030507	988	Functioning at Risk
Sycamore Canyon-Salt River	150601030903	20,668	Functioning at Risk
Shute Springs Creek-Salt River	150601030904	13,992	Functioning at Risk
Horseshoe Bend Wash	150601030605	8,920	Impaired
Middle Pinal Creek	150601030606	4,974	Impaired
Lower Pinal Creek	150601030607	15,828	Impaired
Lower Pinto Creek	150601030706	1,280	Functioning at Risk
Middle Pinto Creek	150601030704	114	Functioning at Risk
Meddler Wash-Salt River	150601030905	60	Functioning at Risk
Corral Creek	150400070201	12	Functioning at Risk
Chalk Creek	150601030902	3	Functioning at Risk

Poor indicator conditions contributing to Functioning at Risk and Impaired ratings for many of the watersheds include: poor riparian condition, presence of exotic and/or invasive aquatic species, infrequent road maintenance, and poor soil condition.

Desired Conditions

According to the Forest Plan, the Tonto National Forest should manage watersheds so as to improve them to a satisfactory or better condition. As the Watershed Condition Framework is currently the Forest Service's accepted measure of watershed condition, satisfactory equates to a rating of "functioning properly".

Purpose Of and Need for Action

The Hicks-Pikes Peak Allotment is a priority for completing grazing allotment planning in conformance with the requirements of the *National Environmental Policy Act* on the Globe Ranger District. Completing this effort on time and to standard is essential. The Tonto National Forest Land Management Plan (Forest Plan) identifies the Hicks-Pikes Peak Allotment as suitable for domestic livestock. The purpose of this action is to consider livestock grazing opportunities on public lands where consistent with management objectives. In addition, per Forest Service Handbook 2209.13, Chapter 90, section 92.22, the purpose of this action is to authorize livestock grazing in a manner consistent with direction to move ecosystems towards their desired conditions.

Authorization is needed on this allotment because:

- Where consistent with other multiple use goals and objectives, there is Congressional intent to allow grazing on suitable lands (*Multiple Use Sustained Yield Act of 1960*, *Wilderness Act of 1964*, *Forest and Rangeland Renewable Resources Planning Act of 1974*, *Federal Land Policy and Management Act of 1976*, *National Forest Management Act of 1976*).
- This allotment contains lands identified as suitable for domestic livestock grazing in the Forest Plan, and continued domestic livestock grazing is consistent its goals, objectives, standards, and guidelines (Forest Plan, pages 24, 91-118).
- It is Forest Service policy to make forage available to qualified livestock operators from lands suitable for grazing consistent with land management plans (Forest Service Manual 2203.1; 36 CFR 222.2 (c)).

It is Forest Service policy to continue contributions to the economic and social well-being of people by providing opportunities for economic diversity and by promoting stability for communities that depend on range resources for their livelihood. (Forest Service Manual 2202.1).

Chapter 2: Alternatives, Including the Proposed Action

Proposed Action – Alternative A

The proposed action consists of four components: authorization, improvements, monitoring, and management practices and resource mitigations. The proposed action follows current guidance from Forest Service Handbook 2209.13, Chapter 90 (Grazing Permit Administration; Rangeland Management Decision making).

Authorization

The Globe Ranger District of the Tonto National Forest proposes to continue to authorize livestock grazing on the Hicks-Pikes Peak Allotment under the following terms:

Proposed authorized use will vary between 650 to 800 adult cattle year-long. Adult cattle may include cows with calves, non-lactating cows, or bulls. Additionally, 700 to 1100 weaned calves up to 18 months of age (yearlings) would be authorized for up to any 7 months within a 12 month period. Yearlings can be any cattle that meet the above criteria, regardless if they are born on the allotment or purchased elsewhere. Table 8**Error! Reference source not found.** shows the proposed permitted number of cattle for the Hicks Pikes Peak Allotment.

Table 8: Proposed Maximum Permitted Use

Class of Livestock	Begin Date	End Date	Number of Authorized Livestock
Adult cattle (cows with calves, non-lactating cows, or bulls)	March 1	February 28	650 to 800
Yearlings (cattle weaned calves and up to 18 months of age)	November 1	May 31	700 to 1100

Initial stocking levels would begin with currently authorized livestock numbers which are 326 adult cows grazed yearlong and 511 yearlings grazed for any 7 months within a 12 month period. As range improvements are installed, or as conditions on the ground allow, authorized numbers may be increased up to the proposed maximum stocking numbers as listed in Table 8. Any annual adjustments would be planned and authorized by the Globe District Ranger, not to exceed the maximum number of livestock. Factors affecting annual authorized livestock numbers may include precipitation, pasture rotation, forage production, current range conditions (i.e. forage and growing conditions), water availability, resource monitoring (see monitoring section below) and permittee needs.

The northern allotment boundary currently follows the Salt River and extends across the Salt River near Pinal Creek, making up Lower Shute pasture. On most of this edge, the Salt River is not a sufficient boundary, which would allow cattle to easily cross the river during low flows. Where the allotment extends across the Salt River, it would be ineffective to fence these areas due to the variation in Salt River stream flows. If cattle were to cross the Salt River during low flows, it would mean cattle would easily find access to neighboring allotments off the Globe Ranger District. The northern allotment boundary would be modified to follow the Salt River. Hicks-Pikes Peak livestock would not be authorized to cross the Salt River and a drift fence would be installed to keep livestock on the allotment (Figure 5).

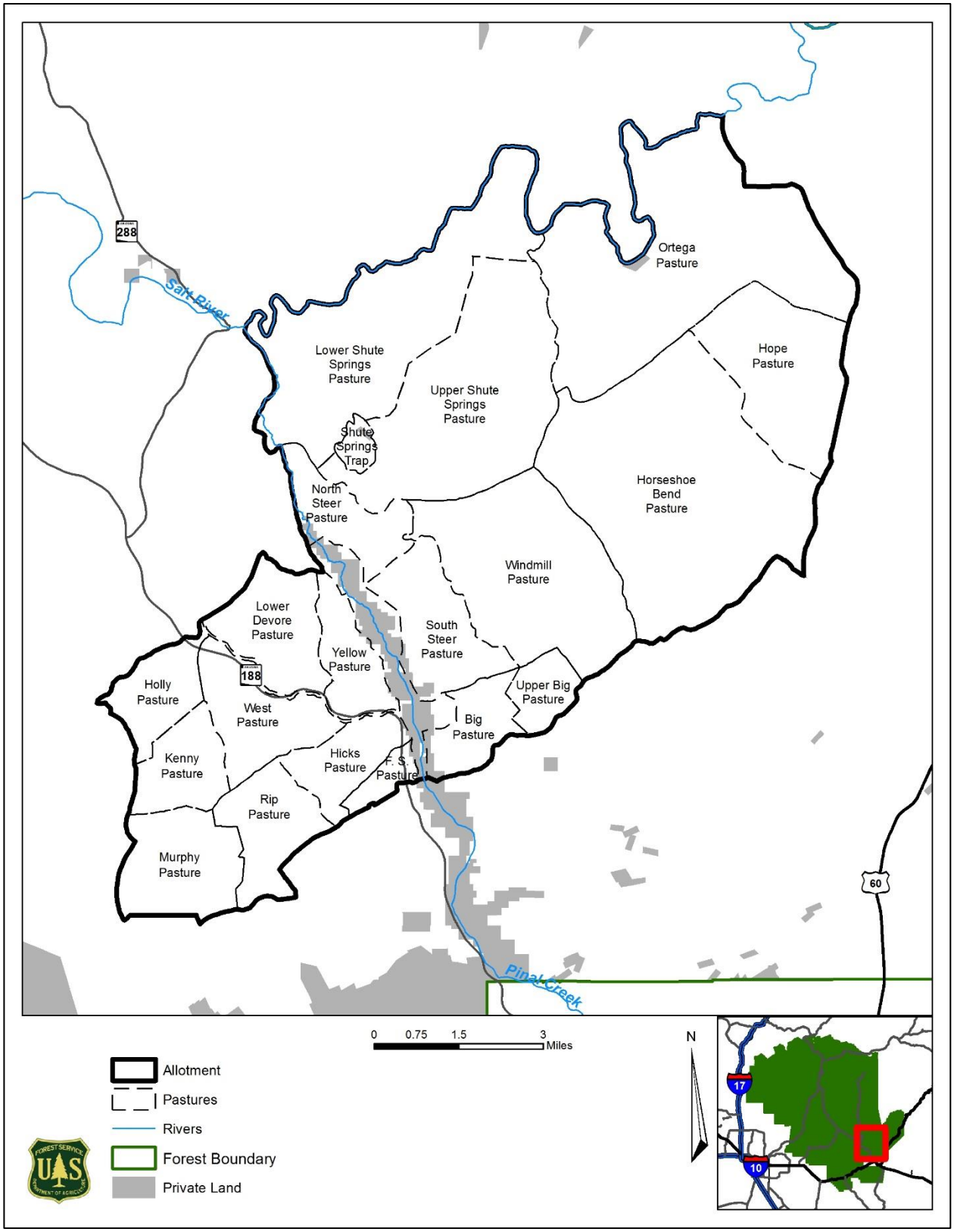

Figure 5: Map Showing Modified Allotment Boundary

Grazing System

Grazing will occur through a rotational system, either deferred or rest-rotation grazing, which will allow plants the opportunity for growth or regrowth. Until necessary range improvements, such as fences and water developments, are installed on the allotment, grazing would continue under the current modified deferred grazing strategy. As new pastures are defined with new fences, and water developments are constructed, incorporating rest into each years' grazing plan will become possible. Adult cattle will be managed in two different herds and yearlings will be managed in a third herd. Bulls may also be separated and run independently for part of the year.

Cattle would be rotated through three units, as described below.

- Hicks Unit: One adult cattle herd would graze in Horseshoe Bend, Upper Shute, Hope, and Windmill pastures. Ortega and Lower Shute pastures would not be grazed until a drift fence is constructed to prevent livestock from accessing the Salt River.
- Pikes Peak Unit: adult cattle herd would graze in Holly, Rip, Kenny, West, Lower Devore, Murphy, and Hicks pastures.
- Pinal Unit: Yearlings would graze in North Steer, South Steer, Upper Big, Yellow, and Lower Big pastures generally from November through May. Bulls may be separated from the Hicks or Pikes Peak Unit and graze in the Pinal Unit as pastures are available.

Annual operating instructions will specify pasture rotation schedules each year and include timing, livestock numbers, and duration. A rotation schedule will be developed with the permittee and incorporated into the allotment management plan to provide an estimate of grazing schedules. This schedule can be altered annually and authorized in the Annual Operating Instructions by the District Ranger.

Range Improvements

Existing Structural Improvements

Existing range improvements on the Hicks Pikes Peak allotment are listed in Appendix D. Maintenance of these improvements would be assigned to the grazing permit holder and will be maintained to standards in the Forest Service Structural Range Improvement Handbook (Forest Service Handbook 2209.22 R3). Additional maintenance standard details will be included in the Allotment Management Plan. Not all improvements were constructed or maintained to current standards. As improvements are reconstructed, they will be rebuilt to new standards (i.e. wire spacing). Existing improvements would not need to be modified until reconstruction is needed. Occasional off-system road travel to inspect or maintain these improvements would be authorized. Where no road exists to reach a specific improvement, a route has been designated and depicted on the allotment map. Off-road vehicle use by the grazing permit holder is discussed further below.

Proposed Structural Improvements

The following improvements would be constructed in order to facilitate livestock distribution throughout the allotment and assist in achieving the desired conditions and management objectives set forth in this analysis. It is not necessary for the proposed additional water

developments to be completed in a specific order or timeframe. Some improvements are identified to be installed within the first two years following a decision on this project. These improvements would have heritage resource surveys completed before a decision is signed. All other improvements listed are expected to be installed later than two years following a decision and will have heritage resource surveys completed before approval to install them is given (Table 9).

Table 9: Proposed Structural Range Improvements to be implemented within the First Two Years

Identifier	Description	Pasture
W1	A pipeline running from Storm Canyon Well #3509 with approximately 2.3 miles of above ground pipeline with 2 troughs.	Ortega
W2	A pipeline running from Grapevine Well # 1323 with approximately 1.5 miles of above ground pipeline with 1 trough, 1 storage tank and a corral.	Ortega
W3	A pipeline running from Shute Spring Well #1245 with approximately 3.0 miles of above ground pipeline, 4 troughs, a storage tank, and a corral.	Lower Shute
W4	Drill four wells on allotment.	
W5	A water system that would pump water from the Salt River to a storage tank and series of troughs in the Ortega and Lower Shute pastures.	Ortega and Lower Shute
F1	Fence to split pasture into two.	Ortega
F2	Fence to split pasture into two	Lower Shute
F3	Install a drift fence near the Salt River to provide a barrier to keep cattle from grazing near the river. A minimum tools analysis would be completed to authorize fence construction in designated wilderness areas.	Ortega
F4	Install a drift fence near the Salt River to provide a barrier to keep cattle from grazing near the river. A minimum tools analysis would be completed to authorize fence construction in designated wilderness areas.	Lower Shute
R1	All numbered roads on the allotment would be requested for occasional maintenance for access to range improvements and livestock management.	Entire Allotment

Additional Infrastructure

In addition to the structural range improvements listed above, additional infrastructure may be constructed if needed in the future. The effects of adding any additional infrastructure such as fencing or waters to achieve resource objectives in the future are disclosed in and tiered to this environmental analysis. Heritage clearances would be obtained before implementation of any future improvements.

- Motor vehicle and or ATV/UTV access to range improvement sites would be on existing roads where practicable. Off-road vehicle use by pickup, trailer, ATV, UTV, or motorcycle needed to transport materials or machinery to maintain or inspect structural

range improvements (fences, corrals, pipelines, wells, windmills, storage tanks, water delivery systems, troughs, earthen tanks) assigned in Part 3 of your term permit as your responsibility for maintenance is authorized. Existing routes or the shortest, most direct route to the improvement must be used and new route construction (i.e. blading a path) is not allowed without additional authorization. Cross-country motorized travel is not allowed when conditions are such that cross-country travel would cause unacceptable natural and/or heritage resource damage.

- Cross-country travel to construct new structural or non-structural range improvements will be authorized following compliance with Section 106 of the National Historic Preservation Act.
- Disturbance to obligate riparian vegetation should be minimized including but not limited to willows, cottonwoods, and sycamores.
- Spring developments would not dewater the spring and must maintain a residual flow for riparian obligate vegetation and wildlife species.
- Natural spring developments and their surrounding riparian vegetation are important winter stop over areas for Migratory Birds and provide important habitat for many riparian dependent species. Exclosure fences built in the vicinity of these areas should be built between at least one quarter and one half acres around the natural spring to maintain the riparian vegetation where possible and comply with Forest Service Policy (Forest Service Handbook 2526.03).
- Archaeological survey would be conducted for areas proposed for surface disturbance which have no previous survey coverage, or have outdated surveys, which do not conform to current standards.
- District Biologist would determine if further consultation with the U.S. Fish and Wildlife Service is necessary for areas proposed for new improvements.
- District Ranger would authorize construction of all new range improvements.

Design Features

All existing and new improvements will follow these design features. These design features are taken from the Forest Service Structural Range Improvement Handbook (Forest Service Handbook 2209.22 R3) or other Forest Service policy and Best Management Practices.

Springs

- All spring source facilities and headboxes should be adequately protected (i.e. buried or encased) or fenced. Headboxes will be constructed of concrete, metal, treated wood or other durable material. Initial pipeline, inside the box, should be fitted with a tee to prevent debris from entering the pipe.
- Horizontal wells must contain a shut off valve and reducer. Entire exterior of the well can be earth covered to prevent freezing.
- Pipelines
- Diameter of pipe should be large enough to carry the flow of the water development but not less than 1 inch.
- Inlet and outlet pipe are protected by anchoring to trough with a single post next to the vertical pipe and a brace or pole supporting the horizontal pipe. Inlet and outlet pipeline will be buried as much as possible for their protection.
- All above ground pipeline supported structures will be maintained to keep pipe at gradient and prevent sagging.

- Pipelines with air and drain valves will be covered with fine screen to prevent rodents and dirt from entering pipeline. Screens must be replaced as needed.
- Pipeline leaks will be repaired or damaged section will be replaced with materials similar to materials from original construction.
- Pipelines with valve covers boxes will be kept covered and repaired when needed.

Troughs and Storage tanks

- Troughs will be kept at heights that make them useable to livestock. Steel troughs should be kept off of the ground. Troughs which become elevated or uneven from trampling or erosion is periodically backfilled to maintain a useable height, authorization may be needed.
- Excess water in trough will be contained in an overflow pipe at least 50 feet away or nearest drainage. End of overflow pipe must be protected from trampling by livestock.
- New water developments will be constructed in uplands, at least 400 feet away from riparian areas, to encourage livestock use out of the bottoms.
- All existing or future water developments that have open tops (i.e. troughs, open top storage tanks) must have escape and access ramps. All escape ramps will be built of expanded metal or similar materials and extend to bottom of trough and sides. Ramp will be firmly secured to trough rim so it will not be knocked loose by animals. Access ramps will be constructed of durable material such as concrete or metal. Slope will not exceed 45 degrees. Further design specifications may be required from "Water for Wildlife" by Taylor and Tuttle 2007.
- Where practical, leave water in troughs for wildlife when not in use by cattle.
- Troughs, storage tanks, and pipelines will be drained and cleaned periodically to prevent moss and debris buildup and damage from freezing.
- Poles, posts, and trough framing materials used in water development construction will be maintained, repaired, or replaced as needed.

Stock Tanks

- Stock tanks will be kept clear of debris, floating logs, dead animals, etc. Spillways will be cleaned and maintained to prevent washing out or becoming plugged. Rodent damage and damaging vegetation on dams will be reported to Forest officer. Other specific requirements will be outlined through a letter.

Fence

- All broken wire will be spliced and repaired and re-stretched to keep tension. Wire splices will be made with 12 gauge size tie wire or type of wire used in initial construction.
- Broken or rotted posts, braces or stays will be replaced where needed to maintain wire tension.
- Top wire on all range fences should be kept at 42 inches in height, and bottom wire should be smooth and 18 inches above ground. General maintenance will adhere to original construction, unless required by Forest Official. Reconstruction will be to these outlined standards.

Gates

- Wire gate tension should be sufficient to prevent gate from sagging and still be easily opened and closed. Gate loops are made of smooth wire, not barbed wire.

Corrals

- Broken or rotten sections of corrals will be replaced as needed to maintain useable condition.

General

- All improvement components (e.g., rusted out troughs, broken sections of pipe, wire etc.) replaced during maintenance or reconstruction will be removed from Forest and properly disposed of.

Monitoring

The objective of monitoring is to determine if management is being properly implemented and if the actions are effective at achieving or moving toward desired conditions.

Monitoring activities may be carried out by the grazing permit holder (permittee) or the Forest Service either during or at the end of grazing season. Monitoring will consist of implementation and effectiveness monitoring in key areas such as: allotment inspections, noxious weed treatments, riparian monitoring, photo-points, utilization height and weight, reading the range, and parker three-step.

Implementation monitoring

This type of short term monitoring determines whether standards and management practices, outlined in desired conditions, were implemented. For this type of monitoring to be successfully gathered, indicators should be collected at least yearly and include such things as inspection reports, forage utilization measurements in key areas, livestock counts, and facilities and improvements inspections. Monitoring would be collected in established key areas, but may also include monitoring outside of key areas.

Effectiveness monitoring

Effectiveness monitoring tracks long-term condition and trend of upland and riparian vegetation, soil, and watersheds. Once data are analyzed, it will identify if management practices are effective toward meeting desired conditions. Examples of effectiveness monitoring indicators include, but are not limited to pace transects, pace quadrat frequency, dry weight rank, ground cover, Parker 3-step, repeat photography, and Common Non-forested Vegetation Sampling Procedures which measures; frequency, fetch, dry-weight rank, production, and utilization.

Monitoring would occur at established permanent monitoring points. Effectiveness monitoring should occur at least once over the ten-year term of the grazing authorization or more frequently, if deemed necessary.

Riparian Utilization Monitoring

Utilization limits for herbaceous riparian vegetation are intended to do two things: 1) protect plant vigor and 2) provide physical protection of streambanks or the sediment on the greenline that could develop into a bank feature. Deergrass was selected as the key species to monitor because it is the most common obligate, riparian, native, perennial grass on the Tonto National Forest. Additionally, deergrass exhibits a number of traits that make it an ideal stream-stabilizing plant.

The above ground attributes of deergrass aid in preventing soil loss through decreasing flow velocity. They also trap sediment which aids in the rebuilding of stream banks. Furthermore, deergrass is a bunchgrass with an extensive root system which acts to stabilize streambanks (Cornwall 1998; Clary and Kruse 2003).

Monitoring short-term indicators, such as stubble height and woody utilization, during the grazing season, can help determine if grazing use criteria is moving riparian conditions toward management objectives over time (Burton *et al*. 2011).

Noxious Weed Monitoring

Noxious weeds located in these allotments would be treated as necessary. Permittee and Forest Service would coordinate weed inventory and treatment. Noxious weed monitoring would be carried out at the same time allotment inspections are conducted. As noxious weed populations are found they are mapped, monitored, and treated. Treatment of invasive species would be carried out in accordance with practices established in Tonto's Environmental Assessment of Integrated Treatment of Noxious or Invasive Weeds as detailed in the decision notice and finding of no significant impact, pages three and four (Forest Service 2012).

Key Areas

A key area is a portion of rangeland or riparian selected because of its representation of pasture, location, grazing or browsing value, or livestock use. It serves as a monitoring and evaluation point for range condition, trend, or degree of grazing use.

Key areas are further defined by seasonality of monitoring: short term or long term. Short term, or annual monitoring, identifies yearly adjustments to livestock grazing, climate, or other factors. Long term data, gathered on five to ten year intervals, measures change in plant community composition, cover, structure, soil conditions, frequency, and management of grazing through trend. Riparian long term data gathers vegetation and stream channel geomorphology condition and trend. These data are gathered on five to ten year intervals, preferably by riparian specialists.

A key area should be an area representative of the range or riparian areas as a whole, an area where livestock use occurs, located within a single ecological site and plant community, and be a minimum of 100 yards from fence lines, exclosures, roads, and trails. Key areas may be identified in the allotment management plan.

Key Areas for all types of monitoring will normally be one quarter mile from water, located on productive soils on level to intermediate slopes and be readily accessible to grazing. Within key areas, an appropriate key species is selected to monitor average allowable use (Forest Plan p. 42-1). Desired conditions contain measurable goals that will be measured at key areas. Over time, changes in resource conditions or management may result in changes in livestock use patterns. As livestock use patterns change, new key areas may be established and existing key areas may be modified or abandoned in cooperation with the permittee and cooperators.

Monitoring Direction

- Data collection procedures and interpretation would consider guidance contained in the *Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands* (Smith et al. 2005), Interagency Technical Reference 1734-3 "Utilization Studies and Residual Measurements" and "Sampling Vegetation Attributes" (1996) (Technical Guide) and the Forest Service Region 3 Rangeland Analysis and Management Training Guide (June 1997) (Training Guide).
- Guidance in monitoring techniques will follow accepted Forest Service protocols set by the monitoring handbook.
- Both qualitative and quantitative monitoring methods would be used in accordance with the Technical Guide and Training Guide.
- Utilization measurements are made following procedures found in the Technical Guide, or the most current acceptable method, and with consideration of the *Principles of Obtaining and Interpreting Utilization Data on Southwest Rangelands*. This document will also provide guidance for utilization data collection and interpretation.
- Key areas are described in "sampling vegetation attributes" (1996) as indicator areas that are able to reflect what is happening on a larger area as a result of on-the-ground management actions.
- Riparian components in key reaches would be monitored using riparian utilization measurements (implementation monitoring) following methods in the Technical Guide or the most current acceptable method.

Management Practices and Resource Mitigations

Livestock Management

For grazing throughout General and Salt River Wilderness Management Areas, practices to minimize impacts to other resources include:

- Permittee will furnish sufficient riders or herders for proper distribution, protection, and management of cattle on the allotment.
- Salt and mineral supplement will be used to distribute cattle. All supplements should not be placed any closer than one quarter mile from natural water sources, recreation sites, designated trails, and within or adjacent to identified/known heritage sites.
- Cattle should be drifted instead of trailed wherever possible. Do not trail through riparian areas as much as possible.
- When entering next scheduled pasture, all livestock shall be removed from previous pasture within two weeks of starting move unless otherwise approved.
- Permittee will monitor livestock utilization and move cattle when triggers are met.
- Permittee would ensure all infrastructures are in functioning condition, as described above, prior to entering the next scheduled pasture.
- Permittee may be asked to provide the Forest Service with Actual Use records and/or Improvement Maintenance records.

Allowable Forest Utilization and Stubble Height Standards

Grazing will be managed to achieve long-term goals in pasture key areas and ensure allowable use thresholds are not exceeded (Table 10).

Table 10: Allowable Use standards

Vegetation	Use Threshold
Upland herbaceous	30-40 percent of current year's growth
Upland browse	50 percent of current year's growth
Riparian herbaceous	Limited to 40 percent of plant species biomass and maintain 6 to 8 inches of stubble height of species like deergrass
Riparian woody	Limited to 50 percent of leaders browsed on upper one third of plants up to 6 feet tall

The Forest Plan limits use to 20 percent of tree and shrub annual production by volume. The percent of leaders browsed was chosen as a surrogate guideline in place of percent volume because volume is an extremely difficult parameter to assess on an annual basis. The method used for determining percent of leaders browsed is an expedient and repeatable sampling technique. Mathematical relationships between the number of twigs browsed and the percent of current annual growth removed have been established in previous studies (Stickney 1966).

Administrative Tools to Respond to Monitoring

The Tonto National Forest manages grazing at conservative use levels (30 to 40 percent) using rotational grazing systems. This grazing intensity should provide for plant integrity, density, diversity, and regeneration over time. Within the scope of the grazing decision, fine-tune adjustments are made annually through the annual operating instructions. Information from monitoring informs appropriate adjustments. Grazing intensity in combination with other factors such as weather patterns, likelihood of plant regrowth, and previous years' utilization levels is used in determinations. Authorized numbers may be adjusted but do not exceed the number set in the grazing decision. The grazing decision and associated allotment management plan is implemented through the term grazing permit and annual operating instructions (AOI). The AOI may also change season of use and pasture rest periods.

Monitoring Indicators

If monitoring indicates that desired resource conditions are not being achieved in the desired time frame or areas for this allotment, there are tools, or administrative actions that will be used to modify management. Such changes may include annual administrative actions to adjust the specific number of livestock and/or animal unit months, specific dates for grazing, class of animal, or pasture rotations. These changes will not exceed limits for timing, intensity, duration, and frequency.

The following is a list of when administrative actions may be necessary in the management of this allotment:

- Monitoring shows management objectives have not been achieved or that trend toward achieving desired conditions is not improving or improving at an adequate rate.
- Annual indicators of grazing use or grazing guidelines are not met.
- Climatic events, fire, flood, or uses and activities detrimentally impact resource conditions and a modification of grazing use is needed to provide for recovery of the site.

Administrative Actions

There are several types of administrative actions that could take place within the allotment. These actions will comply with the Forest Plan and mitigations detailed later in this section. Necessary changes will be implemented through Annual Operating Instructions (AOI), which will adjust use to be consistent with current productivity and resource conditions. The AOI will also include mitigation measures and Best Management Practices (BMP) to avoid or minimize effects to wildlife, soil, and water quality. Modifications to the AOI may be implemented at any time throughout the grazing season in response to unforeseen environmental concerns such as drought, fire, flood, etc., or management and livestock operation concerns.

The following list includes some of these actions:

- Extending or shortening time in a pasture based on utilization levels in uplands and riparian areas;
- Assessing the readiness of a pasture and changing its position in the rotation for the season;
- Time or season of pasture use;
- Resting a pasture for one or more growing seasons;
- Modifying the grazing system;
- In the event of extended drought, severe fire, or depleted rangelands, complete removal of livestock until rangelands have recovered;
- Decrease or increase herd size within the limits of the permitted numbers;
- Temporarily closing off water in a portion of a pasture to manipulate grazing pressure and intensity of use;
- Use of salt and mineral blocks to aid in distribution, especially away from critical areas such as riparian areas;
- Herding livestock;
- Excluding livestock from specific areas temporarily or permanently for other resource objectives; or
- Changing or limiting season of use to minimize impacts to riparian vegetation and water quality.

Off-Road Travel

The following on-going activities requiring motor vehicle use off of designated routes would be authorized to conduct livestock grazing activities on National Forest System lands within the Tonto National Forest:

- Off-road vehicle use by pickup, trailer, ATV, UTV, or motorcycle needed to transport materials or machinery to maintain or inspect structural range improvements (fences, corrals, pipelines, wells, windmills, and storage tanks, water delivery systems, troughs, earthen tanks) assigned in Part 3 of the grazing permit as the permit holder's responsibility for maintenance would be authorized. Existing routes or the shortest, most direct route to the improvement must be used and route construction (i.e. blading a path) would not be allowed without additional authorization.
- Using an off-road vehicle to place supplements in strategic locations for livestock management purposes may be authorized by the District Ranger in the Annual Operating Instructions when requested.

Vehicle use to gather or move livestock off-road would not be authorized. Cross-country motorized travel would not be allowed when conditions are such that cross-country travel would cause unacceptable natural and/or heritage resource damage. Off-road use of heavy equipment (i.e. backhoe, dozer, loader, etc.) may be authorized for range improvement development as needed. Cross-country travel to construct new range improvements and other off-road travel by the permit holder will be analyzed in the environmental analysis for this project. Before new improvements are approved, Heritage clearance would be obtained, including the route to access the development.

No additional Section 106 cultural compliance is required for specific limited-use authorizations already covered by separate decisions under the *National Environmental Policy Act* per The Region 3 Region-wide Travel Management protocol with the Arizona State Historic Preservation Officer. Motor vehicle use in designated wilderness areas would continue to be managed consistent with the provisions of the Wilderness Act [Section 4(d)(4)(2)] that provides for limited exceptions for grazing livestock as further defined in the Congressional Guidelines (Forest Service Manual 2323.22).

Wilderness

Management Area 2B emphasizes wilderness values. It provides for livestock grazing and recreation opportunities that are compatible with maintaining wilderness values and protecting resources. Section 4(c) of the *Wilderness Act of 1964* defines minimum requirements for administrative actions in wilderness areas, which includes grazing. Wilderness resources must be considered when preparing range improvement construction standards and techniques (Forest Service Manual 2323.26a).

Section 4(d)(4)(2) in Forest Service Manual 2320.5 states that "…wilderness designation should not prevent the maintenance of existing fences or other livestock management improvements, nor the construction and maintenance of new fences or improvements, which are consistent with allotment management plans and/or which are necessary for the protection of the range."

Compliance with the *Wilderness Act* in the Salt River Canyon Wilderness area is important and expected of all users on the allotments. The permittee should strive to maintain the untrammeled, natural conditions within wilderness areas. No motorized equipment should be used in wilderness areas without obtaining authorization from the Regional Forester.

Heritage Resources Management

Mitigation of impacts to heritage resources is best accomplished by avoidance of these properties by the placement and construction of all range improvements. It can also be achieved by minimizing the localized concentration of animals, improving distribution across the allotment and across each pasture, and by reducing the intensity of grazing for the allotment as a whole. In instances where proposed improvements will involve any potential for ground disturbance, such as stock tanks and other water developments, a 100 percent archaeological survey will be conducted for areas which have no previous survey coverage, or have outdated surveys, which do not conform to current standards.

Other, more specific mitigation requirements may be identified as each of these improvements is developed and a heritage inventory is made of their areas of potential effect. Such protective measures are developed in accordance with the goals of the project, taking into account site vulnerability as well as the methods of project implementation. All inventoried heritage sites are treated as eligible for the National Register of Historic Places with the exception only of those that have been formally determined to be not eligible in consultation with State Historic Preservation Office (SHPO).

All construction, reconstruction, removal, maintenance and repair of improvements will comply with current Forest direction to protect heritage resources. Archeological clearance must be approved with all necessary consultation with SHPO and the potentially interested Tribes prior to issuing any decision regarding the construction, of all improvements, reconstruction of improvements outside of the existing footprint, or repair and maintenance of improvements away from existing roads or pre-established access. This approach, based on long-term consultation with SHPO and on Region 3 policy as embodied in the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities between the USDA Forest Service Region 3, the State Historic Preservation Officers (SHPO) of Arizona, New Mexico, Texas, and Oklahoma, and the Advisory Council on Historic Preservation,* signed December 24, 2003 (Programmatic Agreement), specifically Appendix H, the *Standard Consultation Protocol for Rangeland Management* (the Protocol) of the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities* (the Protocol) developed pursuant to Stipulation IV.A of the Programmatic Agreement—is considered to be the "standard operating procedure" for treating potential grazing impacts to heritage resources on the Tonto National Forest.

Protection measures identified under the Protocol include:

- Relocation of existing range improvements and salting locations sufficient to ensure the protection of historic properties being impacted by concentrated grazing use.
- Fencing or exclosure of livestock from individual sensitive historic properties or areas containing multiple sensitive historic properties being impacted by grazing.
- Periodic monitoring to assess site condition and to ensure that protection measures are effective.

Other mitigation measures involving data recovery, for example, may be developed and implemented in consultation with the SHPO as the need arises. The appropriate tribes will be consulted, if the mitigation is invasive or if it affects a Traditional Cultural Property or other property of concern for them.

The 1985 Forest Plan and its Amendment 21 (May 3, 1995) establishes standards and guidelines (under Decision Unit (DU) 3) that are applicable throughout the Forest regarding the management and protection of prehistoric and historic archaeological sites and other historic properties. The Amendment states that interpretive opportunities for Heritage (archaeological and historic) resources should be pursued as a high priority when opportunities arise. Other management direction, specifically applied toward the protection of archaeological and historic resources from looting or vandalism is found in the Archaeological Resources Protection Act. If opportunities to

provide educational and interpretive signs are identified in the project area, these may be installed under the direction of the Forest Archeologist and approval of the Globe District Ranger.

No Grazing Alternative – Alternative B

Authorization

Forest Service Policy requires the Forest Service to identify no grazing as the no-action alternative (Forest Service Handbook 2209.13). Under this alternative, livestock grazing would be eliminated from the Forest Service administered lands within the Hicks-Pikes Peak Allotment. The existing grazing permit would be cancelled, following guidance in 36 CFR 222.4 and Forest Service Manual 2231.62.

Range Improvements

No new range improvement projects would be authorized. According to Forest Service Manual, Southwest Region Supplement 2240.3(2), "The Government holds title to all range improvements." All maintenance requirements and agreements for upkeep of rangeland improvement projects (e.g. wells, windmills, troughs, and fences) would be eliminated with the livestock permittee. Developments such as dirt stock tanks, developed springs, and troughs that provide water to livestock also provide water to wildlife. However, without upkeep by a grazing permittee, these developments may not be maintained or may be removed. Interior fences and other infrastructure may be removed, as funding or workforce allows, mitigating potential adverse impacts to wildlife and public users. Water developments, important for wildlife, may be maintained where feasible using other program funds or volunteers. Often, recreational users take advantage of existing corrals and water developments to care for their horses or mules while using National Forest System trails. Where applicable, boundary fence maintenance responsibilities would be transferred to the neighboring permittee.

Monitoring

Standard long term monitoring procedures would continue to be implemented as they have on the allotment following corresponding agency protocols. Other short term monitoring such as utilization would no longer be continued as the allotment would no longer be active.

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Appendix A – Summary of Data and Data Sources for Stream Channels and Riparian Areas

The data used to describe the stream channels and riparian areas in the project area are provided by a variety of sources discussed below. All of the following data are on file at the Tonto National Forest Supervisor's Office in Phoenix, Arizona.

2210 Forest Service Range Allotment Planning Files

These files are housed at the Globe Ranger District of the Tonto National Forest Service in Globe, Arizona. Information from these files was used to describe past management and condition of riparian areas. Much of this information is provided in the Range Report.

Aerial photos, GIS layers and maps

National Wetland Inventory (NWI) maps (USDI, 1991-1995), aerial photos and GIS layers of streams and water sources were used to provide allotment-wide information (1:24000-scale) on stream flow regime (perennial or intermittent) and riparian vegetation cover type. These maps were used to prioritize field visits.

The streams listed in Table 11 include named streams delineated on the Tonto National Forest Stream Route GIS layer and unnamed streams that support riparian vegetation[5]. Riparian vegetation is estimated from the National Wetland Inventory (NWI) maps classified as obligate, broadleaf, and deciduous (for example, cottonwood, willow or sycamore forests) or streams found on field visits to support riparian vegetation.

Table 11: Named Streams and Unnamed Streams that Support Riparian Vegetation within Hicks-Pikes Peak Allotment Pastures.

Pasture	Stream Name	Stream Miles (Perennial)	Stream Miles (Non-perennial)	Miles of Obligate Riparian Vegetation
Ortega	Storm Canyon	0	3.0	0
Ortega	Grapevine Canyon	0	1.1	0
Ortega	Sycamore Canyon	0	2.0	0.5
Ortega	Mud Springs Wash	1.0	1.5	0.1*
Ortega	unnamed tributary to Salt River	0	2.5	0.6
Ortega	Salt River	8.2	0	1.2
Lower Shute Springs	Redmond Wash	0	1.5	0
Lower Shute Springs	unnamed tributary to Salt River	0	1.8	1.8

[5] Miles of obligate riparian vegetation is also taken from the NWI maps (USDI, 1991-1995). The asterisk (*) indicates the miles were adjusted per field data (or Google Earth for some reaches of the Salt River).

Pasture	Stream Name	Stream Miles (Perennial)	Stream Miles (Non-perennial)	Miles of Obligate Riparian Vegetation
Lower Shute Springs	Nail Creek	0	2.2	0
Lower Shute Springs	Shute Springs Creek	0	3.4	0
Lower Shute Springs	Pinal Creek	2.8	0	2.8*
Lower Shute Springs	Salt River	10.0	0	3.4
Upper Shute Springs	Redmond Wash	0	2.0	0
Upper Shute Springs	Shute Springs Creek	0	2.6	0
Hope	Grapevine Canyon	0	3.6	0
Horseshoe Bend	Sycamore Canyon	0	4.5	0.6
Horseshoe Bend	Mud Springs Wash	0	2.3	0.2*
Horseshoe Bend	Wood Springs Wash	0	3.2	0
Upper Big	Negro Wash	0	0.5	0
Big	Negro Wash	0	1.1	0
Windmill	Wood Springs Wash	0	3.1	0
Windmill	Horseshoe Bend Wash	0	3.5	0
North Steer	Pinal Creek	1.4	0	1.4*
South Steer	Horseshoe Bend Wash	0	1.6	0
Lower Devore	Devore Wash	0	2.6	0
West	Devore Wash	0	1.3	0
West	Hicks Wash	0	0.7	0
Hicks	Hicks Wash	0	0.8	0
Hicks	Murray Wash	0	2.3	0
Rip	Hicks Wash	0	1.8	0.7*
Rip	Murphy Wash	0	0.4	0
Murphy	Devore Wash	0	2.4	0.1
Murphy	Hicks Wash	0	2.0	0.1*
Kenny	Devore Wash	0	1.4	1.4*
Holly	Blevens Wash	0	2.3	0.1*
	Total	**23.4**	**65.0**	**14.0**

Permanent Photopoints

There are two permanent photopoints (Table 2) located in riparian areas on the Hicks-Pikes Peak Allotment that have been repeated for multiple years. Both of these are located in Sycamore Canyon and were established in 1992. Both photopoints have shown no apparent change in trend. An upward trend would indicate an increase in the density or size of riparian vegetation and improvement of stream function in the photos over the time of monitoring. For further discussions of trend, see the key reaches section of the Stream Channels and Riparian Areas report.

Field Visits

Field visits are conducted for the purposes of monitoring riparian use, stream channel classification, condition assessment, and inspections and are documented by reports and photographs available in the project record. This data is summarized in Table A3. Stream reaches selected for field visits for this analysis were chosen based on the extent of riparian vegetation indicated on the NWI maps (USDI 1991-1995), and accessibility to livestock.

Reaches were classified according to the Rosgen (1996) system. Some stream reaches were rated using a condition assessment developed on the Tonto National Forest (Mason and Johnson, 2000). Condition assessment is based on stream channel stability. Channel stability is defined as the ability of a stream to carry the water and sediment of its watershed while maintaining its dimension, pattern, and profile, without aggrading or degrading, over time and in the present climate (Rosgen, 1996). The five condition rating classes are stable, slightly impaired, impaired, severely impaired, or unstable. Parameters used to assess stability include depositional pattern, riparian health rating (Thompson et al., 1998), stream channel width/depth ratio, channel stability rating (Pfankuch 1975), and bank erosion hazard index (Rosgen, 1996).

Stream Channel Type Description (Rosgen 1996)

- **“A” type streams** are steep (greater than four percent gradient), entrenched, and confined channels of the headwaters that contain little or no floodplains. They dissipate energy in cascading step/pools.
- **"B" type streams** are moderately entrenched, containing narrow floodplains, and have a moderate gradient (two to four percent).
- **“Bc” type streams** are moderately entrenched have narrow floodplains, like a “B”, and a low gradient, like a “C”. They are probably a step in the evolutionary sequence, C-G-F-C, between F and C when the channel is just beginning to gain back some floodplain.
- **“C" type streams** are not entrenched and have very wide floodplains able to dissipate flood flows and support extensive riparian areas. They have a low gradient (zero to two percent) and display the typical riffle/pool sequence of a meandering stream. "C" type streams are also sensitive to any disturbance, and riparian vegetation is very important for the stability of these streams.
- **"D" type streams** evolve from a more stable stream type due to some natural or management caused disturbance but widen rather than downcutting. They straighten, steepen, and become braided. Braided streams have more than one channel and may change main channels with each high flow. This results in a loss of riparian vegetation and an unstable floodplain. These stream types are extremely unstable and have low potential for natural recovery.
- **"F" type streams** are highly entrenched (downcut), with little or no floodplain to dissipate flood flows, consequently, high flows are concentrated in the stream channel rather than in overbank flow which results in streambank erosion and loss of riparian vegetation. They usually evolve from a more stable stream type due to some natural or management caused disturbance. "F" type streams have a high width/depth ratio (wide and shallow) and lack the stream power, or energy, necessary to move the sediment though the system, causing aggrading. These stream types are generally unstable and extremely sensitive to disturbance.
- The numbers 1-6 indicate the dominant sediment size, 1=bedrock, 2=boulder (256-2048mm), 3=cobble (64-256mm), 4=gravel (2-64mm), 5=sand (.062-2mm), and 6=silt (<.062mm).

Water Sources

The availability of alternative water within a pasture can determine the amount of time cattle may spend in riparian areas. Waters on the allotment were located using the water points layer in the Forest’s Geographic Information System (GIS). This layer contains springs, tanks, and wells for which the Tonto National Forest has water rights or claims, as well as other sources indicated on the USGS topographic maps. Several of the water developments have been inventoried (Table 12).

Numerous water rights claims, applications, and certificates exist on waters located within the project area. These filings are held by the Tonto National Forest, the permittee, or both the Tonto National Forest and the permittee. The databases maintained by the Arizona Department of Water Resources (ADWR) and the Tonto National Forest were consulted to determine water use claims on the allotment. ADWR also published a Preliminary Hydrographic Survey Report (HSR) on the upper Salt River in 1992. It describes all water uses in the upper Salt River Watershed. Uses associated with the project area are described in the report. No water rights in this area have yet been adjudicated by the State. The government holds title to all range improvements, including tanks and spring improvements (Forest Service Manual 2240.3). The Tonto National Forest holds water rights or claims for springs and stock tanks for stock watering for 4,144,825 gallons per year on the Hicks-Pikes Peak Allotment.

Table 12: Water Sources and Inventory Data for the Hicks-Pikes Peak Allotment

State File Number	Use Name	Date	Remarks
33-94336	Hicks Spring		
33-94719	Rip Spring	3/16/2005	Functioning; willow, cottonwood.
33-94720	Pinyon Spring		
33-94723	Hope Spring		
33-94834	Moonshine Spring	3/12/2005	Not functioning.
33-94835	Trap Mesa Spring		
33-94836	Willow Spring		
36-103274	Dragger Horse Spring		
36-105425	Sycamore Spring		
36-105546	Pinal Creek		
36-18997	Lower Cox Canyon Spring		
36-18998	Little Brewster Spring		
36-18999	Laurel Spring	12/20/2006	Functioning; hillside spring.
36-19000	Jump Off Spring	8/10/2007	Could not locate.
36-19001	Jumpoff Water Spring	8/6/2007	Could not locate.
36-19002	Indian Spring	11/7/2005	Functioning; cottonwood, Goodding's willow, ash, seep willow.
36-19003	Horse Spring		
36-19004	Grapevine Spring	4/27/2009	Willows, seep willow, cottonwood, hackberry.
36-19005	Granite Spring		
36-19007	Cold Water Spring	2/20/2010	Functioning; seep willow.
36-19007	Cold Water Spring	8/8/2007	Could not locate.
36-19008	Brush Spring		
36-19009	Bluff Spring	12/20/2006	Not functioning; continuous deer grass, some seep willow and sedges.
36-24028	Procopio Spring	6/22/2007	Needs repair.
36-24029	Rockhouse Trail Spring	3/12/2005	Not functioning; cottonwood.

State File Number	Use Name	Date	Remarks
36-24030	Thirty Nine Spring	7/9/2007	Could not locate.
36-24031	Trap Mesa Spring		
36-24032	Turnout Spring	4/27/2009	Willow, seep willow, mesquite, netleaf hackberry present in sandy wash.
36-24033	Willow Spring		
36-24034	Wood Spring	8/27/2007	Not functioning; mesquite, no riparian vegetation.
36-24035	Cement Spring		
36-24036	Granite Spring		
36-24037	Price Spring	8/7/2007	Could not locate.
36-24038	Upper Cox Canyon Spring		
36-25341	Lower Mud Spring	6/14/2007	Functioning.
36-25342	Moonshine Spring	3/12/2005	Not functioning.
36-25343	Murphy Spring	12/20/2006	Functioning; sedges seep willow, deer grass, mature cottonwood, walnut, ash, sycamore.
36-25344	Mexican Camp Spring	11/8/2005	Functioning; lots of deer grass, walnut, ash, Goodding's willow, cottonwood.
38-23828	Horse Spring Tank		
38-23829	Roy's Tank	5/21/2007	Functioning.
38-23830	Summit Tank	5/11/2007	Not functioning.
38-23831	Apache Tank #2	8/16/2007	Functioning.
38-23832	Shute Tank	2/2/2009	Functioning.
38-23833	Redmond Tank	2/20/2010	Functioning.
38-23834	Apache Tank	8/16/2007	Functioning.
38-23835	Big Pond Tank	5/21/2007	Functioning.
38-23836	Rip Spring Tank	4/26/2010	Functioning.
38-23849	Murray Tank		
38-23923	Rocky Tank	6/14/2007	Functioning.
38-25143	Rockinstraw Tank #2		
38-25144	Rockinstraw Tank		
38-25145	Big Boulder Tank	1/31/2009	Functioning.
38-25146	Kyles Tank	2/6/2009	Functioning.
38-25147	Shute Tank #2	2/2/2009	Functioning.
38-25148	Jackson Tank	5/21/2007	Functioning.
55-600950	Shute Spring Well	9/25/2003	Not functioning; fence down; walnut, willow, herbaceous.
55-600955	Redmond Well	2/20/2010	Functioning; in the wash; cottonwood, willow nearby.
55-600956	Shute Road Well	11/3/2003	Functioning; drinker has no wildlife escape ramp.

State File Number	Use Name	Date	Remarks
55-600957	Little Mud Well		
55-600958	Sycamore Well	5/31/2007	Windmill is inactive; sycamore, walnut, cottonwood in wash.
55-600959	New Water Well	11/22/2003	Functioning.
55-600960	Storm Canyon Well		
55-601045	Big Pasture Well		
55-601049	Summit Well	11/3/2003	Functioning?; drinker has no wildlife escape ramp.
55-601049	Summit Well	5/11/2007	Disconnected.
55-601050	Dago Horz Well	12/23/2004	Functioning?
55-601070	Upper Well	11/22/2003	Functioning.
55-601072	Pinal Well		
55-601073	Devore Wash Well	6/7/2007	Functioning; in the wash; thick willow.
55-601074	Scanlon Well		
55-601075	Rockhouse Well		
55-601078	Dago Well	12/23/2004	Functioning.
55-601079	Lower Well	11/22/2003	Functioning; drinker has no wildlife escape ramp.
55-601079	Lower Well	5/11/2007	Disconnected.
55-601080	Hicks Well		
55-805499	Hicks Spring Well		

Gaged Stream Flow

Streamflow is gaged by the US Geological Survey (USGS) at two sites on the Salt River, one site on Cherry Creek and one site on Pinal Creek within or near the project area. "Salt River near Chrysotile, Az", the most upstream gage, has a period of record of 1924 to present, and the drainage area is 2,849 square miles (USGS 2011b). The “Salt River near Roosevelt, Az” gage has a period of record of 1913 to present, and the drainage area is 4,306 square miles (USGS 2011b). The “Cherry Creek near Globe, Az” gage has a period of record of 1965 to present, and the drainage area is 200 square miles (USGS 2011b). The Pinal Creek at Inspiration Dam, near Globe, Az gage has a period of record of 1980 to present, and the drainage area is 195 square miles (USGS 2011b). The annual hydrograph for the Salt River gages is characterized by a peak in the mean monthly flows in the spring in response to snowmelt followed by a steady decline through June with another smaller peak in August in response to monsoon moisture. The annual hydrograph for the Cherry and Pinal Creeks gages is characterized by a peak in the mean monthly flows in the winter in response to winter storms followed by a steady decline through June with another smaller peak in August in response to monsoon moisture. Mean monthly flows for the period of record are shown in Table 13.

Table 13: Mean monthly flows for USGS gages in the project area (USGS 2011b).

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Salt River near Chrysotile, Az											
651	898	1450	1630	864	296	224	417	334	381	269	470
Salt River near Roosevelt, Az											
1110	1390	1970	1930	989	348	322	592	445	411	369	734
Cherry Creek near Globe, Az											
79	90	82	25	11	6.6	9	15	13	18	17	55
Pinal Creek at Inspiration Dam, near Globe, Az											
30	26	13	7.9	6.3	4.8	6.4	7.8	6.4	7.6	6.4	9.0

Appendix B. Criteria for the Outstandingly Remarkable Values (ORVs) for the Salt River (NPS 2011)

1. **Scenery (S):** The landscape elements of landform, vegetation, water, color, and related factors result in notable or exemplary visual features and/or attractions. When analyzing scenic values, additional factors -- such as seasonal variations in vegetation, scale of cultural modifications, and the length of time negative intrusions are viewed -- may be considered. Scenery and visual attractions may be highly diverse over the majority of the river or river segment.

2. **Recreation (R):** Recreational opportunities are, or have the potential to be, popular enough to attract visitors from throughout or beyond the region of comparison or are unique or rare within the region. Visitors are willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but are not limited to, sightseeing, wildlife observation, camping, photography, hiking, fishing and boating.
    - Interpretive opportunities may be exceptional and attract, or have the potential to attract, visitors from outside the region of comparison.
    - The river may provide, or have the potential to provide, settings for national or regional usage or competitive events.

3. **Geology (G):** The river, or the area within the river corridor, contains one or more example of a geologic feature, process or phenomenon that is unique or rare within the region of comparison. The feature(s) may be in an unusually active stage of development, represent a "textbook" example, and/or represent a unique or rare combination of geologic features (erosional, volcanic, glacial, or other geologic structures).

4. **Wildlife (W):** Wildlife values may be judged on the relative merits of either terrestrial or aquatic wildlife populations or habitat or a combination of these conditions.
    - *Populations:* The river, or area within the river corridor, contains nationally or regionally important populations of indigenous wildlife species. Of particular significance are species considered to be unique, and/or populations of federal or state listed (or candidate) threatened, endangered or sensitive species. Diversity of species is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable."
    - *Habitat:* The river, or area within the river corridor, provides exceptionally high quality habitat for wildlife of national or regional significance, and/or may provide unique habitat or a critical link in habitat conditions for federal or state listed (or candidate) threatened, endangered or sensitive species. Contiguous habitat conditions are such that the biological needs of the species are met. Diversity of habitats is an important consideration and could, in itself, lead to a determination of "outstandingly remarkable."

Appendix C – Legal Locations of Hicks-Pikes Peak Allotment

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Appendix D – Hicks Pikes Peak Existing Improvements

Improvement Number	Improvement Name	Year Built
224001	PRICE HOR SPR	03/01/1968
224002	DAGGER HOR SP	03/01/1969
224003	CABBAGE PATCH FENCE	03/01/1969
224004	MONTE'S CAMP HOR SPR	03/01/1971
224005	HORSE SPRING	03/01/1960
224006	SHUTE SP WELL	03/01/1930
224007	SHUTE SPR WELL PIPELINE	03/01/1930
224008	JUMPOFF SPR	03/01/1930
224009	LAUREL SP	03/01/1930
224010	MURPHY SPR	03/01/1930
224011	MEXICAN CAMP SPR	03/01/1960
224012	39 SPR	03/01/1930
224013	GRANITE SPR	03/01/1930
224014	DEVORE WASH WL	03/01/1930
224015	DEVORE WASH PIPELINE	03/01/1960
224016	BLUFF SP	03/01/1930
224017	HICKS WELL	03/01/1930
224018	COLD WATER SPR	03/01/1930
224019	ROCKHOUSE WELL	03/01/1930
224020	INDIAN SPR	03/01/1960
224021	DAGO SPR	03/01/1960
224022	SHUTE ROAD WELL	03/01/1960
224023	SHUTE ROAD WELL WS	03/01/1960
224024	SCANLON WELL	03/01/1960
224025	MURRAY WASH STK	03/01/1930
224026	SHUTE SP STK	03/01/1930
224027	SHUTE STK #2	03/01/1960
224028	REDMOND MTN STK	03/01/1960
224029	REDMOND WELL	03/01/1960
224030	REDMOND WI WS	03/01/1960
224031	SHUTE SP FENCE	03/01/1930
224032	REDMOND FLAT FENCE	03/01/1930
224033	PIKES PK FENCE	03/01/1930
224034	MURPHY PICKET CORRAL	03/01/1930
224035	MIDDLE WATER CORRAL	03/01/1930
224036	MOONSHINE SPR	03/01/1960
224037	DEVORE WASH CORRAL	03/01/1930

Improvement Number	Improvement Name	Year Built
224038	PICKET CORRAL	03/01/1960
224039	DAGO SPR CORRAL	03/01/1960
224040	ROCKHOUSE CORRAL	03/01/1965
224041	SHUTE WL CORRAL CHUTE	03/01/1967
224042	SQUAW BUTTE CORRAL	03/01/1930
224043	GRAPEVINE CORRAL	03/01/1930
224044	STORM CANY0N CORRAL	03/01/1930
224045	PROCOPIO SPR CORRAL	03/01/1930
224046	BRUSH CORRAL	03/01/1930
224047	SUMMIT CORRAL W CHUTE	03/01/1960
224048	LOWER MILL COR CHUTE	03/01/1930
224049	SYCAMORE CORRAL	03/01/1930
224050	HORSESHOE BEND CORRAL	03/01/1930
224051	BIG POND CORRAL	
224051	APACHE STK	03/01/1930
224052	KYLES STK	03/01/1930
224053	BIG BOULDER STK	03/01/1930
224054	JACKSON STK	03/01/1930
224055	ROCKINSTRAW STK	03/01/1960
224056	ROCKINSTRAW STK #2	03/01/1960
224057	ROCK STK	03/01/1960
224058	HORSE SPR STK	03/01/1930
224059	ROYS STK	03/01/1930
224060	SUMMIT STK	03/01/1930
224061	LITTLE BREWSTER SPR	03/01/1930
224062	PROCOPIP SP	03/01/1930
224063	CEMENT SPR	03/01/1930
224064	SYCAMORE WELL	03/01/1930
224065	LITTLE MUD WELL	03/01/1930
224066	GRANITE SP	03/01/1930
224067	JUMPOFF SPRING	03/01/1930
224068	LOWER MUD SPR	03/01/1930
224069	LOWER GUN CAN SPR	03/01/1930
224070	UPPER GUN CAN SPR	03/01/1930
224071	TURNOUT SPR	03/01/1930
224072	WILLOW SPR	03/01/1930
224073	APACHE STK #2	03/01/1960
224074	GRAPEVINE BARN	03/01/1960

Improvement Number	Improvement Name	Year Built
224075	NEW WATER WELL	03/01/1960
224076	UPPER WELL	03/01/1960
224077	BIG PASTURE WELL	03/01/1930
224078	LOWER WELL	03/01/1960
224079	GRAPEVINE SPR	03/01/1930
224080	SUMMIT WELL	03/01/1960
224081	SUMMIT PL	03/01/1960
224082	WOOD SPR	03/01/1930
224083	WOOD PIPELINE	03/01/1930
224084	PINAL WELL	03/01/1930
224085	STORM CYN WELL	03/01/1930
224086	HICKS DAGGER FENCE	03/01/1930
224087	HICKS PIKES N FEN	03/01/1930
224088	HICKS WINTERS FENCE	03/01/1930
224089	SQUAW BUTTE DIV FEN	03/01/1930
224090	WINDMILL DIV FENCE	03/01/1930
224091	HEADQUARTERS PAS FEN	03/01/1930
224092	LITTLE PASTURE FENCE	03/01/1930
224093	PIKES PK POISON SP S FEN	03/01/1930
224094	PIKES PK SLEEPING BEAUTY	03/01/1960
224095	PIKES PK ALLOT FENCE	03/01/1930
224096	JUMPOFF PIPELINE	03/01/1960
224097	WEST STEER PAS FENCE	03/01/1960
224098	39 SPRING PIPELINE	03/01/1988
224099	ORTEGA HOPE DIV. FENCE	03/01/1995
224100	DEVORE WASH WINDM STORAGE	03/01/1988
224101	HICKS RADIUM BDY FEN	03/01/1930
224102	HICKS SEDOW BDY FENCE	03/01/1982
224103	HICKS ROOT PLOW FENCE	03/01/1970
224104	MAIN DIVISION FENCE	03/01/1989
224105	RIP FENCE	03/01/1989
224106	SHUTE SPRING FENCE	
224107	SHUTE ROAD WELL	
224108	REDMOND CORRAL	
224109	REDMOND WING FENCE	
224110	BIG POND STOCK TANK	
224111	BIG POND CORRAL	
224112	WOOD SPRING CORRAL	
224113	ROYS WINDMILL	2010

Improvement Number	Improvement Name	Year Built
224114	WEST CORRAL	
224115	WOOD SPRING CORRAL	
224116	COTTONWOOD HORIZONTAL WELL	